EDISON ELECTRIC INSTITUTE BULLETIN

VOLUME 1 AUGUST 1933 NUMBER 5

STATISTICAL DATA OF THE ELECTRIC LIGHT AND POWER INDUSTRY

Compiled Monthly by the Edison Electric Institute—Covers 100% of the Industry

DURING THE MONTH OF JUNE

	1933	1932	%
Kilowatt-hours Generated* (net)			
By fuel	3,948,024,000	3,628,725,000	+ 8.8
By water power	2,741,138,000	2,446,805,000	+12.0
Total kilowatt-hours generated	6,689,162,000	6,075,530,000	+10.1
Additions to Supply			
Energy purchased from other sources	224,760,000	178,792,000	+25.7
Net international imports	44,156,000	38,185,000	+15.6
Total	268,916,000	216,977,000	+23.9
Deductions from Supply			
Energy used in electric railway depts.	50,036,000	67,276,000	−25.6
Energy used in electric and other depts.	98,602,000	95,154,000	+ 3.6
Total	148,638,000	162,430,000	− 8.5
Total energy for distribution	**6,809,440,000**	**6,130,077,000**	**+11.1**
Energy lost in transmission, distribution, etc.	1,206,025,000	1,107,738,000	+ 8.9
Kilowatt-hours sold to ultimate consumers	**5,603,415,000**	**5,022,339,000**	**+11.6**
Sales to Ultimate Consumers (Kw-hrs)			
Domestic service	888,701,000	869,104,000	+ 2.3
Commercial—Small light and power (retail)	997,258,000	981,423,000	+ 1.6
Commercial—Large light and power (wholesale)	3,159,186,000	2,617,451,000	+20.7
Municipal street lighting	142,890,000	156,112,000	− 8.5
Railroads—Street and interurban	304,485,000	314,001,000	− 3.0
Railroads—Electrified steam	54,374,000	42,048,000	+29.3
Municipal and miscellaneous	56,521,000	42,200,000	+33.9
Total sales to ultimate consumers	5,603,415,000	5,022,339,000	+11.6
Total revenue from ultimate consumers	$143,367,600	$143,396,100	− 0.0

DURING TWELVE MONTHS ENDING JUNE 30th

Kilowatt-hours Generated* (net)			
By fuel	44,413,170,000	52,335,686,000	−15.1
By water power	31,280,359,000	29,235,716,000	+ 7.0
Total kilowatt-hours generated	75,693,529,000	81,571,402,000	− 7.2
Purchased energy (net)	2,654,485,000	2,729,798,000	− 2.8
Energy used in electric railway and other depts.	1,961,924,000	2,236,624,000	−12.3
Total energy for distribution	**76,386,090,000**	**82,064,576,000**	**− 6.9**
Energy lost in transmission, distribution, etc.	13,934,118,000	13,951,211,000	− 0.1
Kilowatt-hours sold to ultimate consumers	**62,451,972,000**	**68,113,365,000**	**− 8.3**
Total revenue from ultimate consumers	$1,772,767,900	$1,913,463,100	− 7.4
Important Factors			
Percent of energy generated by waterpower	41.3%	35.8%	
Average pounds of coal per kilowatt-hour	1.46#	1.49#	
Domestic Service (residental use)			
Average annual consumption per customer (kw-hr)	598	592	+ 1.0
Average revenue per kw-hr (cents)	5.56¢	5.65¢	− 1.7
Average monthly bill per domestic customer	$2.77	$2.79	− 0.7

BASIC INFORMATION AS OF JUNE 30th

Generating Capacity (kw)—Steam	24,026,200	24,095,900	
—Water power	8,977,200	8,893,100	
—Internal combustion	461,500	450,000	
Total generating capacity in kilowatts	33,464,900	33,439,000	
Number of Customers			
Farms in Eastern Area (Included with Domestic)	(502,201)	(499,494)	
Farms in Western Area (Included with Com'l-Large)	(203,926)	(208,314)	
Domestic service	19,706,381	19,968,755	
Commercial—Small light and power	3,656,527	3,705,172	
Commercial—Large light and power	523,956	557,944	
All other ultimate consumers	64,362	63,891	
Total ultimate consumers	23,951,226	24,295,762	

*By courtesy of the U. S. Geological Survey with deductions for certain plants not considered Electric Light and Power Enterprises.

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EDISON ELECTRIC INSTITUTE BULLETIN

Volume 1 AUGUST, 1933 Number 5

CODE FOR ELECTRIC LIGHT AND POWER INDUSTRY ACCEPTED BY NATIONAL RECOVERY ADMINISTRATION

A "Code of Fair Competition" for the Electric Light and Power Industry of the United States was accepted for the National Recovery Administration by General Hugh S. Johnson, Administrator, on August 11th.

The code, prepared in accordance with the requirements of the National Industrial Recovery Act, was drafted by a special committee of the Edison Electric Institute composed of Messrs. Floyd L. Carlisle, Niagara Hudson Power Corporation, chairman; George O. Muhlfeld, Stone & Webster, Inc.; Wendell L. Willkie, Commonwealth and Southern Corporation; Frank S. Comerford, New England Power Association; John J. O'Brien, Standard Gas and Electric Company; S. R. Inch, Electric Bond and Share Company; John E. Zimmermann, United Gas Improvement Company; George B. Cortelyou, president, Edison Electric Institute, and Bernard F. Weadock, vice-president and managing director of the Institute. This committee began preparation of the code in July, and after several meetings with the Recovery Administration, presented a draft to the Administration on August 5th. After some modifications, suggested by the Administration and agreed to by the committee, the code was approved by General Johnson on the 11th, becoming effective on that date.

According to rulings of the N.R.A., as reported by the Associated Press, the code is intended to cover all electric light and power operating companies, both privately operated and municipal. While the Edison Electric Institute has been designated the agency for administering, supervising and promoting the performance of the provisions of the code, membership in the Institute is not essential to participation in the code since any employer in the light and power industry may participate by signifying his intention and agreeing to pay to the Institute a pro rata share of the cost of administering the code.

To come within the provisions of the Code, companies should sign the President's Reemployment Agreement (the "Blanket Code" submitted to all employers) and the Certificate of Compliance which accompanied the Blanket Code. Above the signature of the executive signing should be inserted on each document the following: "To the extent of N.R.A. consent as announced we have substituted provisions of the code submitted for the electric light and power industry." The documents should be then delivered to the local postmaster, and the provisions of the code put into effect as rapidly as possible. Postmasters will immediately issue the "Blue Eagle" emblem of compliance which may then be displayed as desired by the signing company. Electric light and power companies which come under the provisions of the National Industrial Recovery Act, and which operate in more than one community, may arrange not only to receive the emblem for every community which they serve, but also to be listed in the Post Office in each community served as having complied with the provisions of the National Industrial Recovery Act.

Copies of the code have been mailed by the Institute to all companies and municipal plants in the United States and these have been asked to keep the Institute informed of their actions on the code.

The full text of the code follows:

CODE OF FAIR COMPETITION

Submitted in Substitution of

PRESIDENT'S REEMPLOYMENT AGREEMENT

for

ELECTRIC LIGHT AND POWER INDUSTRY OF THE UNITED STATES

Purpose

The declared purpose of this code is to effectuate the policy of Title I of the National Industrial Recovery Act during the period of emergency as to all persons, firms, associations or corporations producing, transmitting, distributing and/or selling electricity.

Definition

The Edison Electric Institute affirms that it imposes no inequitable restrictions on its membership and participation in its activities, and it is truly representative as a national association of the electric light and power industry of the United States.

I

Labor Provisions

As required by Section 7 (a) of Title I of the National Industrial Recovery Act, the following provisions are conditions of this code:

1. Employees shall have the right to organize and bargain collectively through representatives of their own choosing, and shall be free from the interference, restraint, or coercion of employers of labor, or their agents, in the designation of such representatives or in self-organization or in other concerted activities for the purpose of collective bargaining or other mutual aid or protection.

2. No employee and no one seeking employment shall be required as a condition of employment to join any company union or to refrain from joining, organizing or assisting a labor organization of his own choosing; and

3. Employers shall comply with the maximum hours of labor, minimum rates of pay, and other conditions of employment, approved or prescribed by the President.

II

Child Labor

After Aug. 31, 1933, no person under 16 years of age shall be employed, except that persons between 14 and 16 years of age may be employed for not to exceed 3 hr. a day and those hours

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PRIZE WINNERS IN ELECTRIC RANGE CONTEST CONDUCTED BY NATIONAL ELECTRIC COOKERY COUNCIL

The 38 prize winners in the five contests making up the New Victory Electric Range Contest, held during April, May and June, and conducted by the National Electric Cookery Council have been chosen by the judges of the contest.

The National Judges, Mr. Merle Thorpe, Editor of *Nation's Business;* Dr. Kenneth Dameron, professor of marketing, Ohio State University, and Mr. George Richardson of J. Walter Thompson Advertising Agency, were highly complimentary of the number and character of reports received.

LESLIE WEISS
Metropolitan Edison Company

Over 200 retail salesmen and 80 range dealers, exclusive of utilities, submitted reports to divisional directors, while 48 commercial managers and 42 local cookery councils submitted reports to the National Cookery Council Headquarters. For complete all-around detail, variety of activities, ingenuity of conception and aggressiveness in performance, the great majority of the reports were excellent. All indications point to the successful conclusion of the new victory contest as being a stimulating and broadening activity which should result in increased efforts for the development of electric cookery locally and nationally.

The prize winners were as follows:

Divisional Directors' Contest—Among the 11 divisions, the award was made to the director whose division: (a) accomplished the largest percentage of divisional range sales quota during the contest, (b) excelled in the number and character of Local Cookery Council promotions, such as cookery schools, demonstrations, consumer and employee contest and training, etc., (c) had organized the largest number of active local cookery councils up to the end of the contest.

W. C. BELL
New England Power Association

Mr. W. C. Bell, director of the New England Division, and vice-president of the New England Power Association, was awarded the prize—the Preston Arkwright Cup.

In recognition of the splended accomplishments in two other divisions, the judges gave honorable mention to Mr. A. H. Schoellkopf, director of the Eastern Division, and Mr. M. L. Hibbard, director of the Northwest Division.

The judges considered and expressed their compliments to several other divisional directors whose personal efforts deserve the highest commendation, but whose territories' results did not measure up to an equal standard.

Local Cookery Council Contest—Four prizes totaling $3,750 were awarded to the councils: (a) reaching the highest percentage of local quotas assigned to the contest period, (b) securing the greatest percentage of eligible local dealers to become actively participating members of the Local Council (c) doing the most of and best kind of promotional advertising and other promotions such as cookery schools, demonstrations, sales force training, customer and employee contests, etc.

First prize of $1,500 was awarded to the Electric Cookery Council of Reading, Pa., which is ably sponsored and directed by Messrs. Leslie Weiss, sales manager, Metropolitan Edison Company, C. R. Lyons and F. L. Lederach, president and secretary respectively of the Electric League of Reading.

ROBERT H. GIEDD
Virginia Public Service Company

Second prize of $1,000 was awarded to the Dutchess County Electric Cookery Council of Poughkeepsie, N. Y., which is sponsored by Mr. H. E. Dexter, commercial manager of the Central Hudson Gas & Electric Corp., and energized by Mr. Wm. M. Anderson, its capable chairman.

Third prize of $750 goes to the Western New York Electric Cookery Council of Buffalo, N. Y., which is aggressively led by Mr. George J. Reichert, merchandise manager of the Buffalo, Niagara and Eastern Power Corp., and Mr. S. S. Vineberg, secretary-manager of the Electrical League of the Niagara Frontier.

Fourth prize of $500 was awarded to the Electric Cookery Council of Richmond, Va., under the supervision of Mr. A. G. Morgan, chairman, and Mr. L. F. Riegel, sales manager of the Virginia Electric & Power Co.

(Continued on page 160)

CHAIRMAN DAVIDSON URGES EARLY PREPARATION FOR REFRIGERATION WEEK

With Sales and Public Interest Now at Peak, Event Should Have Unprecedented Success—666,750 Units Sold in Six Months

"Upon the success of Electric Refrigeration Week, Sept. 30 to Oct. 7, may easily depend the realization in 1933 of an all-time sales record for the electric refrigeration industry," says James E. Davidson, executive chairman of the Electric Refrigeration Bureau, in a statement in which he calls upon all branches of the industry to join in the annual nation-wide fall activity which the Bureau is sponsoring this year for the third time.

"The record-breaking total of 213,420 household units sold in June of this year," says Mr. Davidson, "brought the sales total for the first six months to 666,750. It would seem, therefore, that our year's quota of 800,000 should easily be realized. What we want to do, however, is to hit the million mark, a goal which we almost reached two years ago and which we can reach this year with properly coordinated effort.

"Electric Refrigeration Week offers us the opportunity to gain the needed impetus which will put us over the top in October, November and December.

"To all local Bureaus, Electrical Leagues and other cooperative bodies interested in the sale of electric refrigerators my earnest advice is that you start now to make your plans for participation in this national activity. You will find that it is none too early to get your show program under way if, in fact, you have not already started. There is a lot of preliminary work entailed if your show is going to be a success and a real credit to your community.

"The Electric Refrigeration Bureau has been busy for weeks in the preparation of its promotional campaign. About Aug. 15 it will issue to all local Bureaus and central stations a folder which will remind them of Refrigeration Week and urge them to be prepared to offer the fullest local cooperation in the national activity.

"This announcement will be followed, on Sept. 1, by a booklet which will give complete information, in the most minute detail, as to how to put on an electric refrigeration show. This information will be based upon the actual experience gained in hundreds of cities of varying sizes where successful shows have been

(Continued on page 163)

ELECTRIC REFRIGERATION BUREAU

SALES—HOUSEHOLD MODELS ONLY—FIRST SIX MONTHS 1933

	Year's Quota	Six-Months Quota—64%	Estimated Total Sales	% Quota Realization
New England Division				
Connecticut	15,316	9,802	10,451	106.6
Maine	6,234	3,390	3,624	90.8
Massachusetts	39,027	24,977	33,874	135.6
New Hampshire	4,009	2,566	2,472	96.3
Rhode Island	6,435	4,118	6,139	149.0
Vermont	2,626	1,681	1,781	105.9
Eastern Division				
Delaware	1,607	1,029	1,617	157.1
Maryland and D. C.	15,944	10,204	19,216	188.3
New Jersey	39,021	24,973	29,673	118.8
New York	123,949	79,327	108,494	136.7
Pennsylvania	68,754	44,003	67,612	153.6
East Central Division				
Kentucky	8,934	5,718	9,881	172.8
Ohio	51,228	32,786	43,961	153.6
West Virginia	6,149	3,935	7,600	193.1
Middle West Division				
Iowa	15,232	9,748	9,815	100.6
Kansas	11,343	7,260	8,996	123.9
Missouri	22,078	14,130	26,417	186.9
Nebraska	7,837	5,016	6,057	120.7
Pacific Coast Division				
Arizona	2,295	1,469	1,613	109.8
California	62,735	40,150	37,487	93.3
Nevada	569	364	511	140.3
Northwest Division				
Idaho	2,582	1,653	1,549	93.7
Montana	2,785	1,782	2,432	136.4
Oregon	7,893	5,052	4,557	90.2
Utah	3,850	2,464	3,189	129.4
Washington	14,270	9,133	6,964	76.2
Southeastern Division				
Alabama	5,470	3,501	6,543	186.8
Florida	7,687	4,920	4,845	98.4
Georgia	6,537	4,184	7,952	190.0
North Carolina	8,601	5,505	10,593	192.4
South Carolina	3,427	2,193	3,879	176.8
Tennessee	7,830	5,011	6,860	136.8
Virginia	8,733	5,589	10,947	195.8
Great Lakes Division				
Illinois	61,455	39,331	46,242	117.5
Indiana	22,386	14,327	15,791	110.2
Michigan	35,191	22,522	20,400	90.5
Wisconsin	20,689	13,241	10,977	82.9
North Central Division				
Minnesota	15,809	10,118	9,667	95.5
North Dakota	1,996	1,277	1,318	103.2
South Dakota	2,558	1,637	1,782	108.8
Rocky Mountain Division				
Colorado	6,745	4,317	6,144	142.3
New Mexico	1,091	698	1,113	159.4
Wyoming	1,045	669	996	148.8
Southwestern Division				
Arkansas	3,664	2,345	3,742	159.5
Louisiana	6,525	4,176	4,926	117.9
Mississippi	2,742	1,755	1,937	110.3
Oklahoma	8,346	5,341	9,287	173.8
Texas	20,941	13,402	24,827	185.2
Totals	802,170	513,389	666,750	129.8

"BETTER LIGHT—BETTER SIGHT" PROGRAM

First page of first issue of publication to promote this cooperative activity

For additional copies of the E. E. I. LIGHTING NEWS
Address
C. E. Greenwood
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Single copies, 10c
In lots of 25, 8c each.

E. E. I. LIGHTING NEWS

Send news or suggestions for E. E. I. LIGHTING NEWS to any member of the SPECIAL COMMITTEE on LIGHTING PROGRAM whose names and addresses will be found on page two of this issue

Volume 1, No. 1 **July 1933**

EYESIGHT CONSERVATION MAJOR OBJECTIVE

Clever Slogan Sounds Keynote of Activity

"Only as people appreciate the value of *seeing* will they appreciate the value of *light*," said Dr. M. Luckiesh in an interview granted to your correspondent in his remarkable laboratory at Nela Park, Cleveland. Dr. Luckiesh, in collaboration with Mr. Frank K. Moss, recently honored with the Gold Medal of the Distinguished Service Foundation of Optometry which honor he shares with Dr. Luckiesh, is deeply engrossed in developing the "new science of seeing". What this new science means to the public is a practical improvement of about 20 percent in the useful value of their eyes. What it means to the lighting industry is some considerable millions of dollars in the sale of media which will accomplish this 20 percent "seeing" improvement.

Nor must the more efficient utilization of present equipment be overlooked. S. G. Hibben, recently addressing the Lighting Economics Conference at Case School of Applied Science, pointed out dramatically that while research and invention are adding so greatly to our seeing facilities, the careless and wasteful manner in which we use what we already have is a most discouraging factor.

Public Service Emphasized

It is significant that the Edison Electric Institute should emphasize in its 1933 program of lighting development the element of public service which is inherent in all true lighting improvement. The selection of the slogan, "Better Light—Better Sight," is recognition of this industry's obligation to the buyer and user of light and lighting equipment. As has been stated by Mr. J. E. Davidson and other spokesmen of the utility industry, the sale of "raw" light may well be a crime committed upon the purchaser: only as that light conserves eyesight is its sale justifiable.

It will be noted that the slogan does not read, "MORE Light—Better Sight." Mere increases in wattages, mere sales of larger bulbs, mere changing from small bad lighting units to large bad lighting units—none of these penny-grabbing objectives are a part of this activity. The true objectives is *better light*, and the inevitable consequence will be *better sight*.

As a general proposition, however, better light does actually mean more light. That is a truth you simply can't get away from. Dr. Luckiesh proved this truth by experiments on some 60,000 subjects and how easy, practicable, and economical it is to have proper illumination in the home.

(Continued on Page 4, Column 1)

MANY LOCAL CAMPAIGNS ALREADY BEING PLANNED

Forehanded Utility Men Are Starting Now

Reports from utility companies which have conducted successful lighting sales operations during the depression reveal that plans are already being laid for aggressive participation in the E.E.I. Lighting Activity, now that the business uplift is under way.

It will be news to many lighting men that even during the days of the bank holiday, cooperative sales campaigns on lamps and less expensive types of units were carried forward to success. The Southern New York Group of Associated Gas & Electric, utilizing the home-lighting "Ivoryglow" unit, sold 101 percent of its stiff quota while the banks were closed, and the local contractors and dealers who co-operated were relatively as successful. American Gas & Electric, pioneering the new approach to selling lighting with the aid of the Weston light meter, showed astonishing increases in commercial lighting sales at a time when this class of load was fading fast throughout the country.

It is understood that both these organizations are laying careful plans for the big E.E.I. drive next October and November.

WHITWELL SEES NEED OF SPEED

George E. Whitwell

George E. Whitwell, chairman of the sales committee of the Edison Electric Institute, is emphatic in declaring that the success of the E. E. I. Lighting Activity depends in large measure upon the effectiveness of local plans as worked out between the utilities and their local representatives of manufacturers, jobbers, electric leagues and the retail and contracting groups.

Speed in organizing, planning and "ironing out wrinkles" is essential in the opinion of those in charge of this activity. They point out that carefully-thought-out lighting sales plans have won success during the darkest days of the depression when sales resistance was as a stone wall, and that hurried and immature plans failed to pay a profit even during the peak of prosperity. "The only chance I can see for this activity to fail," said J. F. O'Brien, member of Chairman Skinner's subcommittee on operations, "is the fatal error of procrastination. 'You can't wait till harvest time to plant your seed,' is an old saying which particularly applies to all programs such as this."

Launch Great Drive in Lighting

Coordinated Activity Planned to Embrace All Branches of Lighting Industry

SLOGAN IS CHOSEN

Over fifty slogans for the E. E. I. Lighting Activity were offered at the first meeting of the special committee in charge of operations, the one suggested by H. Freeman Barnes being the final selection. In commenting upon this item of the committee's work, M. E. Skinner, chairman, said:

"An apt and terse slogan is among the most important factors in a continuous commercial drive such as ours. The florist association's, "Say It with Flowers," has sold many millions of dollars' worth of flowers. The paint association's, "Save the Surface and You Save All," put uncounted millions of gallons of paint on shabby houses. It is our firm belief, that the slogan adopted for the Institute activity, "Better Light—Better Sight," will fill millions of empty sockets with lamps, that it will add many millions of kilowatt-hours to lighting load, and that it will help to sell a few millions at least of new, improved and well-priced portables and fixtures.

"It is the hope of this committee that the lighting industry as a whole will adopt the slogan, use it in newspaper and magazine advertising, print it on letterheads and display it prominently in show windows and in lighting equipment departments of stores. The strength of a good slogan lies in its continuous repetition—it grows stronger and more effective from a sales standpoint every time it is repeated."

A tremendous drive to promote the proper and adequate use of lighting to conserve the eye sight of children, workers and home folk, to make illumination an even more profitable tool for commerce and industry has been announced for this autumn by the Edison Electric Institute. All branches of the lighting industry will participate in this nation-wide activity.

Lighting thrift has been carried too far—declare the sponsors of this program. Lighting standards, which at the peak were none too adequate have been reduced far below the point of efficiency. Due to inadequate lighting with which a mistaken thrift has gloomed the country, the eye sight of children has been imperiled, industrial workers are less safe and less productive because of hampered vision, homes are less cheerful and retail trade is additionally handicapped.

As a result, revenues of utility companies have decreased, fixture and lighting glassware manufacturers and dealers have seen their normal volume of business dwindle to a mere trickle and lamp factories not only report decreased sales, but their records show that smaller and smaller bulbs are being bought.

Industry Unified in Service

The activity has the dual purpose, therefore, as all successful commercial activities must have, of serving the public with something it honestly needs and should have at a fair profit to those who render the service. Utilities, fixture manufacturers, lamp manufacturers, wholesalers and repairers of lamps and fixtures, and installing electrical contractors stand shoulder to shoulder in this greatest of lighting sales activities to win back the ground lost in the depression and carry lighting standards to higher levels than ever before.

The lighting program is in strong hands. Pending the organization of the Lighting Sub-Committee of the Sales Committee, Chairman George E. Whitwell has appointed a special committee consisting of M. E. Skinner, chairman, H. Freeman Barnes (General Electric Company), J. F. O'Brien (Westinghouse Lamp Company), and C. E. Greenwood, who direct commercial activities for the Institute, to operate the plan. But while this compact sub-committee will be charged with detailed operation, the plan and program have the endorsement and active cooperation of practically every top executive in the utility industry, from President George B. Cortelyou down.

All Branches Have Joined

Nor is this solid backing restricted to the utility group of the industry. Affiliated organizations in the retail and wholesale fields, and others, have signified their intention and willingness to cooperate in this fall drive and are actively making plans to enlist the support of their memberships.

All the branches of the electrical industry have been invited to participate and assist locally in setting up a plan of procedure to further the cause of good lighting in their respective communities. It was emphasized that although the activity is planned on a national basis, it is intended for local development and execution. Lamp and fixture manufacturers who advertise nationally will tie-in their advertising with the activity during October and November. However, the major advertising and sales promotion will come from local groups, in which the utility, manufacturer, jobber, retailer, electric leagues and others will plan their drives to fit their own conditions.

Headquarters of the Institute will make available recommendations and plans which have proven practical in the field, and inform

(Continued on Page 4, Column 4)

Better Light Better Sight

CORTELYOU URGES ALL EXECUTIVES TO ACTION

George B. Cortelyou, president of the Edison Electric Institute, fired the first gun in the pending lighting activity in the form of a letter sent out on July 5th to all member company executives urging their active co-operation.

President Cortelyou thus identifies his administration with a policy of progressive commercial co-operation. Naturally and properly he views the proposition from the utility company viewpoint—from the viewpoint of revenue and customer welfare. Yet his wholehearted endorsement gives

George B. Cortelyou

vitality and authority to this program which has been lacking in many past efforts of similar purpose. His letter—

"TO MEMBER COMPANY EXECUTIVES:

"Revenue from lighting service for a number of months has been appreciably affected by the reduced use of lighting. It is believed that this curtailment has reached the point where it is as injurious to the welfare of our customers as it is prejudicial to company revenue.

"The Sales Committee of the Edison Electric Institute, with the approval of the Operating Committee, proposes that during the months of October and

(Continued on Page 4, Column 1)

PAST COORDINATED PROMOTIONAL PROGRAMS

"A Perfect Record of Success" Says J. E. Davidson

Of these things we are certain: our coordinated promotional activities have developed a finer service to our customers; our cooperative enterprises have produced a finer trade relationship, creating greater sales, with the result of greater kilowatt-hour consumption.

I shall endeavor to recall these coordinated campaigns to your memory and to outline briefly the scope, objectives, and results.

The Better Home Lighting Contest
(1924-1925)

The Better Home Lighting Contest was strictly non-commercial. Our chief objective in this activity was to make certain that people generally, including children, would be fully aware of the benefits of proper illumination, especially preservation of eyesight,

In order to create nation-wide interest, a Better Home Lighting Contest was conducted among the school children of the public and parochial schools of America. A number of valuable prizes were offered. First prize was a $15,000 electrical home, completely equipped. There were also ten college scholarships, ranging from $1,200 to $300 in value.

Following is a quick summary of the scope of the campaign:
Population affected, 90,000,000;
Communities with schools cooperating, 3,000;
Total pieces of promotional material distributed, 10,057,000;
Total primers distributed, 2,000,000;
Total essays submitted, 1,000,000.

(Continued on Page 2, Column 3)

CLASS OF SERVICE
This is a full-rate Telegram or Cable-gram unless its character is indicated by a suitable sign above or preceding the address.

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M. E. SKINNER, CHAIRMAN,
E. E. I. COMMITTEE ON LIGHTING PROGRAM
NIAGARA HUDSON POWER CORPORATION,
BUFFALO, N. Y.

OUR COMPANY JUST COMPLETING PLANS FOR LOCAL ACTIVITY WHICH WILL BE BIGGEST DRIVE ON LIGHTING THAT WE HAVE EVER STAGED STOP BELIEVE CONDITIONS ARE RIPE THIS FALL FOR REAL RESULTS STOP ALL TYPES OF CONSUMERS HAVE BEEN POSTPONING BUYING FOR SO LONG NO QUESTION IN MY MIND OUR CO-ORDINATED PLAN WILL RESULT IN RECOVERY OF SUCH LIGHTING REVENUE AND MANY NEW SALES OF EQUIPMENT.

J. E. DAVIDSON

LOAD BUILDING OPPORTUNITIES IN THE AIR CONDITIONING FIELD

By C. E. MICHEL

Union Electric Light and Power Company, St. Louis, Missouri

An address before the Third Session of the 1st Annual Convention of the Edison Electric Institute, Chicago, Ill., June 7, 1933.

In presenting this subject it is not my intention to take up your time with a statistical review of what has been accomplished in air conditioning, nor with dreams of what the future may hold, for air conditioning has definitely arrived at a point of development which can be defined and described, and which offers a clear-cut opportunity for our industry.

During the years 1929 to '32 inclusive, our company expended a considerable sum on the development and promotion of air conditioning. Some of the things we did during this period were faulty, but out of the experience we have learned how to avoid certain mistakes, and the much larger expenditure which we intend to make during 1933 will be based on the lessons learned, particularly during the past year.

Something happened in 1932 which made a reality of the air conditioning business in so far as the Utility Sales Department is concerned. Previously it had not been a business in which that department could play a very large part. Vast quantities of development work had been done and much progress in the art had been made, but air conditioning installations were still tailor-made for each particular job and each job had to be engineered by those experienced in the many different branches of the air conditioning field. Air conditioning had not yet crystallized into something which the Sales Department could take hold of with a definiteness of program and purpose and a reasonable certainty of results, but the year 1932 saw the arrival of standardized air conditioning units and with them the opportunity we sought. There are available today practical standardized units that meet almost every requirement of the utility company sales department.

It is no longer necessary to design in detail every part of an air conditioning installation. While some technical knowledge is still necessary on the part of the salesman, it is nevertheless true that the further development of the industry depends more on sound promotion and salesmanship than on engineering. The standardization of air conditioning units has made it possible to select with confidence a suitable unit for the particular installation under consideration.

It is scarcely necessary to point out that the electric refrigeration business developed in precisely the same way. That, in its beginning, it was an unorganized effort to supply refrigeration needs through specially engineered installations, and that it did not become a real sales department job until standardized units had appeared. The rapid and substantial growth of that business followed immediately the introduction of standardized units and, in my opinion, this will, to a great extent, be duplicated in the expansion of the air conditioning business, now that standardized units are available. Failure on our part to understand and grasp this opportunity seems to be the one thing that can prevent this development.

A brief survey of the merchandise available shows that we have something to sell in this field just as we have merchandise to sell in the field of electric refrigeration, electric motors and other major appliances.

1. There are available self-contained room cooling units for small rooms, equipped with a ½ horsepower motor, which sell for around $300.00.
2. Compact units ranging from ¾ to 1½ horsepower are available for larger rooms, and these can be installed for from $650.00 to $800.00. In installations where more than one of these units are connected to a single compressor, the cost may run as low as $500.00 per room.
3. For larger areas units are available ranging from 1½ to 20 horsepower. This class of unit is the big accomplishment of the year.

All of the foregoing are factory built units, just as, for example, refrigerated display cases are factory built. All that it is necessary to do in the field, after making the proper selection, is to put them in place and connect them up with the necessary electric, refrigerating and plumbing hook-ups.

A development of extreme interest is the practical air conditioning equipment for installation in connection with residential heating systems. As soon as new residential construction is resumed in volume, this phase of the market will demand more and more of our attention, as it is now possible to install in a residence a mechanical warm air heating system fully equipped for all year 'round air conditioning at a moderate cost, and through proper selection of equipment the occupant has within his control, at all times, just what part of the house is to be air conditioned.

Announcement has recently been made of a new room cooling unit ready for the 1933 market, which not only provides for cooling and dehumidifying during the summer, but also for heating the room by the use of the reverse cycle of refrigeration. We do not know the technical and mechanical details of this unit and it has yet to prove its practicability, but this presents an entirely new picture—instead of using the two hp. compressor for 1000 to 1200 hours a year, it is to be used for heating during the cool days of the year and it is likely that an additional 1000 hours of use may be made of this compressor. A unit which serves approximately 500 sq. ft. of floor space and uses 4000 kwhrs during a year certainly warrants our serious consideration.

It is interesting to note how the cost installed of commercial units has been lowered during the past year. As an example, in 1932 we figured an installation for a store of approximately 1750 sq. ft. Our cost estimate was between $3,500 and $4,000 for the complete installation. Just a few days ago an order was placed for equipment to cool and dehumidify this store at a cost installed of $2,000, or about half of our original estimate.

While it is not possible in every case to reduce the actual cost to a square foot basis, we have found that the floor area of a store is an excellent index for preliminary estimates, and for the reason that on this floor area generally depends the number of persons who will frequent the store and the human load is the largest single item entering into the

determination of the size of equipment required.

The availability of all this equipment which has largely come to pass within comparatively recent months is of value to us particularly because the markets are ready and waiting. This statement may appear unduly optimistic, but a review of the history of air conditioning will, I think, show otherwise.

Air conditioning, like other businesses, had an industrial beginning. In the textile industry it was found that the uniformity of product throughout the year was difficult, if not impossible, because of the changing conditions of the air. Long research finally developed equipment for the simultaneous control of temperatures and humidity, and this solved, to a great extent, the problems of the textile industry. Tobacco, clay products and the chocolate industries similarly solved their production problems with mechanical air conditioning.

In these fields the term "air conditioning" is used in its broadest sense to include not only cooling and dehumidifying, but also heating, humidifying, cleansing and circulating of air. It is not always necessary that all six of these elements be present in order to classify an installation as air conditioning. In fact, the most spectacular phase of air conditioning, that is air conditioning for summer comfort, may include only cooling and dehumidifying—and it is the development of summer air conditioning which has focused attention of the public on the entire subject.

So long as air conditioning remained merely a means of improving or standardizing industrial processes, it generally escaped public notice and held but limited possibilities for us. However, when it entered the spectacular phase involving human comfort, it quickly caught the interest and attention of the general public and became of major importance to our own industry. Certain large theaters found it good business to keep their patrons comfortable during the summer. They installed equipment which had served to solve the problems of industry and found that it paid. Whatever this may have accomplished for the theaters, it is beyond question that this established mass acceptance for air conditioning. Large de luxe restaurants saw an opportunity for themselves, installed air conditioning equipment and thus still further exposed the public to the idea and still further developed a public appetite for comfort cooling.

This market existed as long ago as 1930. Even then there was some actual demand and this was supplied through specially engineered jobs, but the development of standardized units in 1932 served to convert these potential markets into actual markets. The sales which have been made and the inquiries which are developing give us every right to say that the markets available to us now and which await our sales endeavors, are almost without limit.

In order to picture these opportunities, we must consider the reasons which prompt the purchase of air conditioning. It is used—

1. For improving or standardizing industrial processes,
2. For commercial profit, and
3. For individual working efficiency, personal comfort and relief in illness.

The vastness of such a market is a subject in itself and can be touched here but lightly.

In addition to the advantages gained through cooling and dehumidifying, it is obvious that there are many benefits to be derived in winter through maintaining proper humidity and through properly cleansing and circulating air. Experience indicates that profitable use of air conditioning can be demonstrated in all manner and types of stores, from the small grocery to the largest department store—in all those places where people congregate.

In many sections of the United States complete office buildings have been constructed with air conditioning in every room. A well-known hotel man recently made the statement that no one would find it profitable today to erect a new hotel without supplying conditioned air to every guest room, for a traveler leaving an air-conditioned train would certainly notice a tremendous contrast in a hot, stuffy hotel room and take his patronage elsewhere, once he found the way to a properly cooled hotel. This man is a man who handles hotels nationally, and his opinion is quite important.

Our experience has been gained in St. Louis and we know that the weather is an important factor in determining the markets for air conditioning, but it is by no means the only factor. In sections of the country where the average summer temperature is quite bearable, there are nevertheless periods of extreme discomfort due to both temperature and humidity. Furthermore, even on a comfortable day in summer, when numbers of people gather indoors, the temperature and humidity conditions rapidly become uncomfortable. In restaurants in all parts of the country the cooking and serving of hot foods so affects the temperature that the air must be conditioned in order to avoid extreme discomfort for patrons.

In addition to cooling and dehumidifying, there are other air conditioning requirements which can be developed into sales. Winter humidifying, air purification and circulation all offer opportunities for the use of electric energy.

I have repeatedly heard the opinion expressed that residential air conditioning lies a long way in the future. Our experience indicates that the development of this market is not far away. Out of 44 installations using mechanical equipment, made in St. Louis during 1932, 16 were in residences and only two were for industrial processes. The balance were for offices and commercial installations. These results were secured from a general promotional effort which did not lay special emphasis on residential business. It is our opinion that the residential field is a fertile one.

Now, what does this mean to the utility? The hours of usage of a space cooling installation will vary in different sections of the country. In St. Louis, experience has shown that a residential installation will be in operation for an average of 1000 hours during the season. If only one room in a residence is cooled with a connected load of 1½ kilowatts, such an installation will use an additional 1500 kilowatthours during the summer months.

One residence in St. Louis last year installed equipment for cooling three rooms with a total connected load of 3 kilowatts. Contract has already been signed for an additional 1½ kilowatt unit, so that the total load in this particular residence will now be 4½ kilowatts and the use of an additional 4500 kilowatthours during the summer months.

A completely air conditioned office building in St. Louis last year used refrigeration for 1,253 hours while operating on a five day week. During that time it used 171,990 kilowatthours for refrigeration only, while the total usage for air conditioning purposes, including fans and air washers, was 270,989 kilowatthours for the year.

A grocery store found cooling and dehumidifying beneficial to its business and the annual consumption for this purpose was 15,500 kilowatthours. The connected air conditioning load is 15.75 kilowatts. A large theater with a connected load of 375 kilowatts, has an annual consumption for all year 'round air conditioning of 412,000 kilowatt-

hours. A restaurant with a connected load of 12.75 kilowatts uses 10,000 kilowatthours annually. A large hotel has two of its restaurants cooled with a total connected load for this purpose of 68 kilowatts and an annual usage of 78,000 kilowatthours.

The connected air conditioning load on our lines is 5773 kilowatts, made up of 103 installations of which—

14 are for industrial uses
7 in theatres
14 in restaurants
31 in offices and salesrooms
8 in retail stores
26 in residences
1 in a broker's board room
1 in a mortuary, and
1 a completely air conditioned office building.

During the last forty-five days, contracts were placed in St. Louis for a number of installations, even though the warm weather had not as yet set in. Included in this list is a completely air conditioned residence where cooling and dehumidification are provided during the summer and humidification, air circulation and cleansing during the entire year.

It is interesting to note that our promotional activity started yesterday in St. Louis. We had published nothing, we had not even approached the trade, and yet in the past forty-five days we contracted for more air conditioning load in St. Louis that we did during the entire year of 1932, when we had an extensive promotional campaign in swing. That sounds quite confident when I make the statement that this year will work out satisfactorily.

It is significant that whereas during 1932 we had only three manufacturers sales organizations to cooperate with us on a substantial scale, we are assured for 1933 of such cooperation from at least ten prominent manufacturers with others still to be heard from. Our program this summer is on a more extensive scale, and since the conditions in the industry have developed so favorably, we feel confident of satisfactory results.

In conditioned air, if it be only cooled and dehumidified air, we have something the public wants, something they need, and now with standardized units we can supply that need and supply it profitably. It remains for us to do the job to the benefit of all concerned.

DISCUSSION OF MR. MICHEL'S PAPER

BY R. H. TILLMAN
Consolidated Gas, Electric Light and Power Company

Air conditioning, as applied to industrial purposes and representing a valuable electric load for the utility supplying power, needs to be considered under two classifications.

In the first group fall those uses which are indispensable, or practically so, because of the nature of the product manufactured or the methods of production.

In the second classification are to be found applications which, while not indispensable, at the same time afford definite advantages which reflect in the quality of product, speed of production, elimination of operating difficulties, working comfort, etc.

Under present economic conditions, manufacturers whose use of air conditioning would come under the second, or "advantage" grouping, are reluctant to make the investment. Many of them are thinking terms of air conditioning; some of them are securing figures pertaining to its installation and operating cost; they are weighing its possibilities, but delaying final action.

This is due to the fact that despite its obvious benefits and the desirability of having air conditioning, many of the advantages are intangible, or at least difficult to evaluate; whereas, in order to justify an investment today, a definite financial return is demanded. Even such factors as "faster production," "improved quality," "better working conditions to increase efficiency," do not receive the attention they deserve at a time when the objective is to reduce factory overhead and lessen production costs. In fact, we must prove the economics in every effort to make an expenditure in these industrial installations.

The situation in the commercial field is much the reverse. Here, air conditioning is definitely a sales feature that affords to the establishment adopting it, a competitive advantage; attracts attention and patronage, both because of its advertising novelty value as well as its beneficial results; produces an actual and substantial increase in sales revenue and profits. These considerations exist, whether the establishment is a theater or a department store, a bank or a restaurant, a specialty shop or a funeral chapel. The introduction of improved temperature and humidity control into one establishment is soon followed by similar installations in the same field; the pressure of competition often forcing this step.

The progress so evident in the commercial and residential fields should have an important effect in the industrial field. In other words, the economic factors which are delaying the adoption of air conditioning in industry, are working to promote its adoption in many commercial establishments. This means that a groundwork is being laid—of public interest and recognition—which will mature into industrial business as conditions improve. Air conditioning today is going into the very places where the general public can most readily become familiar with it and observe its advantages.

A laundry owner, for example, seeing the result of air conditioning in stores and theaters, had us undertake an analysis of the requirement to effect improved working conditions for his factory personnel. In this case, and at this time, the cost proved to be prohibitive. The amount of refrigeration and air control necessary to combat the heat and excessive humidity in a laundry would represent a kilowatt installation ranging from two to three times that at present required for the laundry proper. Nevertheless, the laundry field is one which at some future date will, no doubt, afford important air conditioning possibilities, with methods perfected for reclaiming the heat taken from the atmosphere and utilizing it in heating water or in some other recuperating process.

Industrial operations which necessitate a controlled condition of temperature, or humidity, or both, already comprise a large field of power use. Many of these applications are not ordinarily considered as air conditioning because they usually consist of one-purpose operations. The refrigeration, which is required in meat packing plants, in the cooling and processing rooms, is, after all, an air conditioning function. In Baltimore, with a connected load of 2600 kw. to supply the electric requirements of the 20 larger meat packing establishments, there is approximately 1125 kw. of this total used for cooling and refrigerating purposes. This use represented more than 3,000,000 kwhr. last year.

In textile manufacturing, the require-

ment is one of humidification. The ratio between the total amount of power and the amount needed to maintain correct atmospheric conditions, varies with different mills. One Baltimore mill, out of a total of 3000 kw. installed, used 150 kw. on air compressors to operate the humidifying sprays. Another mill uses only 16 kw. out of a total of 1500 kw. connected, for their humidification which is done by means of pumps and whirling nozzles instead of by compressed air.

Refrigeration for packers and humidification in textile mills are both typical examples of the "necessity" class of conditioning. Plants such as these involve a large present power consumption, but their possibilities as a source of additional air conditioning load depend upon the extended and augmented use of air conditioning facilities.

In textile mills, for example, working comfort and efficiency could be increased by the addition of refrigeration to keep the temperature down to a comfortable level during hot weather, and no doubt would prove to be economical. In the case of meat packers, humidity control, in addition to refrigeration, should offer possibilities for the improved processing and storage of meats, preventing them from drying out and losing weight. At the same time, other factory operations as well as office quarters could well be equipped to have proper temperature and humidity conditions by utilizing a part of the air conditioning facilities for this purpose.

Low temperature rooms are necessary in all candy factories. There are nine larger producers of this commodity in Baltimore, only one of which has adopted any method of atmosphere control other than refrigeration. Out of a total of 180 kw. connected, this customer uses 68 kw. to supply conditioned air—cooled and dehumidified—in their chocolate dipping or enrobing department, in the packing and storage rooms, in the starch department, and also in their offices, where it has been introduced to provide working comfort in hot weather. The proportion of kilowatts for air conditioning to the total power load in this factory, is 37.5 per cent. The other eight factories have a total connected load of approximately 700 kw. Of this amount, only about 150 kw., or 19 per cent, is used for refrigeration to cool certain process and storage rooms. On the basis of what the one manufacturer has done, it appears that the candy industry is now using only about half the air conditioning that would best serve its needs.

Another good illustration of the extended use of its air conditioning facilities is afforded by a small manufacturing confectioner (not included in the number above). This establishment conducts a retail store in connection with its manufacturing department, and it has installed cooling and dehumidifying units in the store, operating from the central refrigerating compressor, as a comfort feature for customers.

A similar idea was utilized by a furrier who maintained fur storage facilities in connection with his retail salesrooms. A refrigerating installation, amounting to 15 kw., supplied conditioned air to the sales floor in addition to serving the storage rooms.

The manufacture of hygroscopic drugs and chemicals is a recognized field for air conditioning, although it is limited by the comparatively small number of firms engaged in this kind of business. Of the many drug and chemical manufacturers in Baltimore, there is but one, so far as we can determine, whose products necessitate humidity control. This is Bromo Seltzer, and the air conditioning installation amounts to 90 kw. Their annual power consumption for air conditioning is approximately 40,000 kwhr., which is a little more than one-tenth of their total electric use.

There are many small manufacturing plants in which drying processes can best be done by conditioned air. These include such special applications as the quick drying of glue products, extraction of moisture by rarefied air, and the supply of dry air so as to exclude moisture during all the stages of manufacture and packaging.

A manufacturer of bottle caps uses air conditioning, consisting of refrigeration and dehumidification, in the rooms where their cork liners are stored and processed. These liners are made of granulated cork, with which a binder material has been mixed. It is this binder that is susceptible to atmospheric moisture, and unless kept and worked under controlled dry conditions, it becomes sticky and impossible for the automatic machines to handle properly. The power installation on this job is 75 kw.

The first publishing house in the city to use air conditioning is now installing equipment for humidity control in part of their composing and press rooms. A room content of approximately 2000 cu. ft. is being conditioned with silica gel equipment, utilizing about 9 kw. for blowers, etc. This printer experienced difficulty with the shrinkage and expansion of the wooden blocks on which printing cuts are mounted. Since their work necessitated very accurate production, they are taking this step to insure uniform condition of their printing plates at all times.

It is the condition of the paper, however, rather than the plates, with which most printers and lithographers have the greatest difficulty. When printing is being done in several colors, correct register depends upon the elimination of paper shrinkage or stretching, and this in turn, is a matter of humidity control. Paper in storage absorbs a large amount of moisture and during the hot, humid days of summer there are many times when it is necessary for printing firms to operate their heating plants simply to dry out the stock. Various methods are resorted to, such as suspending the paper from racks and placing electric fans to blow upon it. All of this involves labor and handling as well as delays, and the results are only approximate. Air conditioning in paper stock and press rooms would insure accurate conditions at all times. The ideal application would also effect comfort for working personnel. There are at least 25 printers and lithographers in Baltimore of sufficient size to justify air conditioning, and the electric power for this purpose should be in the neighborhood of 500 kw. As this class of business is almost general throughout the country, the potential power market is good.

Telephone cable has to be made under conditions which are free from all possibility of moisture. The small wires of which the cable consists, must be perfectly dry at the time they are enclosed in the lead sheath, as any trace of moisture would attack the thin insulation covering each wire and set up a destructive short circuit. The Baltimore factory engaged in this work utilizes air conditioning obtained by means of silica gel dehumidifying equipment. The electric installation in connection with this apparatus is 50 kw., using approximately 120,000 kwhr. per year under normal conditions.

Makers of scientific instruments and precision or delicate machinery, as a rule, require air conditioning at some stage of their manufacture. Baltimore's only factory in this class has a room where measuring instruments are calibrated, in which exact conditions of temperature and humidity are maintained day and night. The interesting feature about this installation is the fact that electric heat is used to maintain temperature in cold weather.

To date, no air conditioning has been

installed to serve the clothing industry, although this is a field in which it has a definite use. One large clothing manufacturer investigated its possibilities in connection with its stock rooms and salesroom, its purpose being to maintain finished stocks in better condition, prevent clothing from losing its shape, and eliminate the necessity for frequent repressing. It is estimated that the larger clothing establishments in Baltimore could utilize at least 250 kw. for air conditioning to serve this need.

Any survey of industrial air conditioning should take into consideration the use of ice in certain types of air conditioning apparatus. Ice manufacturers are devoting time and money to the development of this field for the utilization of their product, and since industrial power enters into the manufacture of the ice, this outlet is one in which we are definitely interested. Two Baltimore theaters are equipped with this type of cooling and their season's consumption of ice represents approximately 175,000 kwhr. used by the ice manufacturer. One ice manufacturer has conditioned the offices by this method and is also making progress in the development of ice cooled and humidity controlled rooms and meat boxes for markets, butchers and stores. Our total connected load to ice manufacturers is about 7700 kw., and the advance of air conditioning systems utilizing ice is a valuable factor in building this load. Closely related to this is the requirements of cold storage plants, which represents an additional 1450 kw. connected.

A review of our present air conditioning business, exclusive of refrigeration and ventilating, and taking into account only such installations as involve humidity control as well as temperature and air distribution, shows a total of 42, amounting to approximately 2490 kw. connected, and using about 2,000,000 kwhr. per year. These installations consist of—

		kw.
7	Industrials	321
9	Theaters	1,292
8	Restaurants	79
6	Banks	347
3	Offices	19
1	Department Store	124
1	Library	245
1	Lecture Hall	33
1	Hospital Dept. (Oxygen Rooms)	15
1	Small Store	3
1	Funeral Chapel	5
3	Residences	7
42		2,490

The average kilowatt connected for the restaurants is low, due to the fact that two of the largest installed steam ejector systems which, while utilizing one of our company services—District Steam—at the same time require very little electric power.

Aside from the economic handicap, progress in industrial air conditioning is at present slow because sales and engineering efforts are being concentrated upon the more immediately lucrative field of comfort cooling in stores, theaters, offices, homes, etc. The industrial installation, except where its use is imperative, is more difficult to sell, and it requires more study, more engineering ability and time to design, and every installation is a special problem.

Engineering ability in determining the type of installation for a particular job, and intelligent supervision and regulation after it is installed, are matters which cannot receive too much emphasis. The fact that self-contained air conditioning units are coming in to supersede the centrally operated system for so many purposes, does not alter the situation, that it is personal feeling which gives the final verdict of satisfaction and success. This applies wherever the comfort feature is concerned, and it must be borne in mind that different persons react differently to temperature and humidity. It is impossible to effect a condition that suits everyone perfectly.

Industrial applications are different in this respect, that the problem is one of maintaining a fixed condition of humidity, or temperature, or both, in order to meet definite operating requirements or process needs. As comfort for increased working efficiency begins to receive more attention in the industrial field, new factors will have to be taken into consideration in industrial installations—factors that will have to be considered in designing the system and in controlling its operation.

The rapid rate of improvement in commercial applications will, in all probability, create new possibilities for industry to utilize air conditioning in ways hitherto unsuspected. Some of these may have to do with comfort to improve efficiency and increase production; others will be determined by the nature of the product or by new manufacturing methods resulting from air conditioning advantages. The science of air conditioning, which was born of industrial necessity, is for the time being devoting most of its energies to other fields, but it has not completed its work in the factories of the nation.

DISCUSSION BY D. M. DEBARD

Stone & Webster Service Corporation

Mr. Michel has clearly portrayed the load building possibilities of air conditioning and given us much helpful data on installations now operating in St. Louis. For all this data we are most grateful.

In the few minutes allotted, I want to discuss this subject with particular reference to promoting air conditioning in the home and the office.

Comfort cooling, which is cooled and de-humidified air, is something the public wants. Marked advance has been made by manufacturers in equipment but I am not so sure, as stated by Mr. Michel, that the further development of the industry depends more on sound promotion and salesmanship than on engineering. This very young child needs its mother, the engineer, to overcome a great many difficulties that now exist. As a concrete example—I am familiar with an installation in a certain utility office in the South. This office is equipped with standard apparatus manufactured and installed by one of the leading manufacturers. A great deal of care was given to the installation. However, this particular job did not give the perfect comfort expected. This was especially true after a number had been smoking in the room. The air became heavy and one distinctly noticed a lack of fresh air. The point I wish to bring out is that the engineer is still needed to perfect such installations if a rapid development is to take place. The unsatisfactory results obtained in this one installation have dampened the enthusiasm of promotion in that city.

I am of the opinion that residential and office air conditioning apparatus cannot be considered perfected as is the electric refrigerator and tossed in the lap of the sales department to promote. The utilities, however, should do their full share in assisting the manufacturer. This can only be done when the manufacturers and utilities coordinate their field efforts.

I have discussed with a number of the leading apparatus manufacturers their engineering and promotional sales plans for the coming year. In general,

the manufacturers are planning to use their own dealer outlets for the stocking and selling of air conditioning apparatus. The manufacturers are preparing complete engineering data to assist dealers in installing and servicing air conditioning apparatus. The manufacturers want to have the utilities select one or more men, preferably from the Power Sales Division, to whom they can provide complete engineering data. It is the opinion of the manufacturers that the utilities will promote the idea and assist the dealers in engineering and in closing sales. The financing and servicing should be jointly handled by manufacturer and dealer.

A committee last year of the Residential Sales Bureau, of which Mr. W. E. Clement of New Orleans was Chairman, made a study of air conditioning and its promotion. The committee had many meetings and rendered a report to me, as General Chairman, which, due to reasons with which you are familiar, printing has been delayed. In this report, they made many suggestions for promoting residential air conditioning which I wish to make known to you.

"Summed up, the activities on the part of the utility company should include the following:

1. Create a purely promotional department of one or more sales engineers who shall specialize in the art of air conditioning as to its ramifications in both the technical and sales sense.

2. Establish and maintain a friendly cooperative policy with the active local dealers or representatives who are trying to sell air conditioning equipment.

3. Employ the use of as much advertising and demonstration as the utility company's budget will permit.

The functions of the promotional department shall be as follows:

(1) Act in the capacity of a consulting engineer, promoter of sales, and sales trouble shooter for the active local air conditioning dealer.

(2) Assemble a list of prospects for residential air conditioning, developing active prospects from cold canvass by means of personal letters followed up by means of personal interviews.

(3) Establish a "dealer-cooperative" policy by contacting each local representative of air conditioning equipment who is expected to actively enter the field of selling air conditioning. It is here recommended that the utility company offer to these air conditioning representatives free sales and technical engineering services. This service is to consist of the services of the above specialized sales engineers who shall be able to contact a prospective customer, make an engineering survey—calculate equipment necessary—and help dealer to close his sale by inculcating a desire for air conditioning in the mind of the prospect.

(4) In view of the fact that this equipment is ordinarily handled through various types of dealers it has been found desirable in certain cities to form cooperative promotional organizations in order to coordinate efforts. In such an organization the local utility should naturally take the lead. It is the committee's idea that it might be advisable to include certain suggested principles governing sales operations, to which all members of the Air Conditioning Association might be induced to subscribe. Among the important principles to be considered from the utility standpoint are:

1. Ethical merchandising practices.
2. Reliable equipment.
3. Uniform standards of installation.
4. Equipment capacities—methods of estimating requirements and operating costs.
5. Utility to act in capacity of sales promotion agency for the dealers and technical counsel for the customers.

It would seem that such an Association, functioning somewhat along the lines of local Refrigeration Bureaus might be effective, and a strong factor in centering attention on this development.

(5) In addition to advertising along usual channels, sales plans should provide for organized methods of presenting information to the public regarding this service. While meetings and demonstrations may be held under the auspices of the Air Conditioning Association, it would be necessary for the utility to handle the movement and prepare the programs. The success of these meetings which might be arranged before Women's Clubs, professional clubs, domestic science classes and other organizations of an educational nature, would naturally depend on the type of programs presented. The unfavorable effect of extreme temperatures on the human body could be presented in a most impressive manner by some competent medical authority. Manufacturers of equipment, heating and ventilating engineers and utility men, might also present at these meetings other interesting phases of this subject now receiving so much attention in the public press.

A suggested method of demonstration is as follows:

Through cooperation with one or more of the leading hotels or apartment houses and the manufacturers of air conditioning equipment—arrange to have a room, or possibly a suite of rooms properly air conditioned, prospective users to be invited to be the guests of the utility company or dealer for one or more nights in order to practically demonstrate the many desirable features of air conditioning in the home.

It has been demonstrated that even the most indifferent prospect for air conditioning can often be won over to enthusiastic support by experiencing the otherwise not appreciated comfort and restfulness of a night spent in an air conditioned bed room during hot sticky weather.

As a means of breaking down sales resistance, this method is considered to be one which will undoubtedly be very valuable to the salesmen, and at the same time help interest the hotel or apartment house management in the installation of air conditioning equipment."

Comfort cooling and air conditioning in the home and office has every indication of a great future. History records that during every depression a new major industry has been born. Who knows but what air conditioning will be that new industry.

Air conditioning has a health appeal, particularly with hay fever patients. Doctors are beginning to recommend it in many instances. It has a comfort appeal, one of the greatest points in selling. From the utility point of view, one room equipped with air conditioning in the home will more than double the yearly average kwhr. now used.

The time is ripe for utilities, manufacturers and dealers to coordinate their engineering and sales efforts in promoting air conditioning and bringing this health and comfort device to the attention of all.

DISCUSSION BY WILLIAM H. HODGE

Byllesby Engineering and Management Corporation, Chicago

The enterprise shown by Mr. Michel's company in giving serious attention to the air conditioning field is in itself commendable. Other power companies owe it a debt of gratitude. Because of the initiative shown in St. Louis that city has been watched rather closely by those interested in air conditioning development.

It would seem evident that Mr. Michel's organization is not yet prepared to supply operating and earnings data upon which to base an estimate of the present or potential value of this class of business or the cost of putting it on the lines. While the information which he has given us is encouraging and helpful to other sales managers trying to decide just how to approach the problem, I think we must agree that what we want most of all at present is as much detailed operating information as possible.

As nearly as I can determine the policy of the majority of power companies up to date has been one of "watchful waiting." Few, if any, have actually done as much or spent as much money in the way of promotion as the St. Louis company, but most of them have devoted

some attention to air conditioning, and many will make a considerably greater effort this year than before.

Just what kind and how much of an organization should be set up; what relations should be established with the manufacturers and distributors of equipment; what degree of responsibility should be accepted in development and what financial commitments should be assumed, are questions of an extremely pertinent nature confronting our sales departments.

For many years American industry has been able to exploit new fields and enlarge old ones in a rather blind and costly manner, but we have a situation today which makes it at least questionable whether such methods can be effective in future progress. As a matter of fact, there is no need that they should be.

The need for thorough study of air conditioning, both from the mechanical and commercial points of view, seems to be well recognized in the electrical industry. This accounts for the conservative attitude of many companies. Many, however, have devoted much time to investigation and educational efforts within the last 12 months. Correspondence courses have been prepared by educational and manufacturing interests and found acceptance. In some cities, air conditioning schools have been organized, with power company cooperation, as for example in Louisville, where more than 100 enrollments were made in a 12-lecture course terminating this month. Some of these lectures, incidentally, were delivered in a tobacco and cigar manufacturing plant, which has about 500 hp. installed in a complete air-conditioning equipment. They cannot make cigars with machines without it.

The Louisville school indicated the wide interest in air conditioning at present, and also showed the large number of diversified manufacturing, distributing and specialty firms which expect to participate in satisfying this market. Each lecture period was handled by an expert in his particular line, and the school had the assistance of recognized authorities, such as Dean F. Paul Anderson of the University of Kentucky.

The cautious policy of most power companies thus far is perhaps typified by that of the Duquesne Light Company of Pittsburgh, a company which has been by no means backward in profitable development activities. The subject was first considered in a broad way in 1931, when a fairly thoroughgoing investigation was made of the status and possibilities of this class of business in the company's territory. As a result of this study it was decided to have a power engineer spend approximately one-half of his time on air conditioning. After he became familiar with his task, an educational plan was set up for the men in the power sales division. Several meetings were held in 1932, at which manufacturers' representatives supplied information. Two pieces of direct-mail literature were sent to selected prospects, these illustrating some of the existing air-conditioning installations in Pittsburgh.

In March of the present year a school was conducted for 25 salesmen and engineers over a period of four weeks, during which equipment was displayed, calculations performed and motion pictures presented. The subject was dealt with from various angles. The final meeting included exhibits of unit-type equipment and was attended by many architects, engineers, contractors, heating and ventilating men, and others.

The sales plan being followed contemplates close contact with manufacturers through the head of the air-conditioning section; contact with prospects by men of the power-sales division; written reports on interviews, progress, etc.; a complete filing system available to salesmen and continued supervision by the man directly in charge of the work.

As yet it has not been found possible to add unit-type equipment to the line of electric and gas appliances merchandised in the company's 12 stores. The gas-house-heating division of an allied natural gas company cooperates in endeavoring to secure winter air conditioning features in new-house-heating installations, with provision for future cooling installations.

Sales results in Pittsburgh in 1932 were negligible, only 43 hp. of such equipment, with estimated annual revenue of $1,167, having been installed. Prior to 1932 there was a total air conditioning load of 3676 hp., with an estimated annual kilowatthour consumption of 2,488,600 and annual revenue of $37,560. Therefore, the present connected load in Pittsburgh consists of 3719 hp., with estimated annual consumption of 2,551,880, and annual revenue of $38,727. It will be noted that this works out at a little better than $10 per horsepower year installed capacity.

The principal installations consist of seven theaters, the first floor of one large department store, two women's apparel shops, four restaurants and one radio station studio. It is safe to say that the majority of these installations came about independent of any effort or lack of effort on the part of the power company.

Some definite progress is being made this year by the installation of complete air conditioning equipment in the model homes or bungalows, now common in the office buildings of larger companies, and extensively used for meeting purposes by the home-service departments. Usually these layouts are in the basement and are practically unusable on hot summer days. This was the case in Oklahoma City where the company is now installing air conditioning equipment, which will not only serve for demonstration purposes, but will also considerably increase the usage of the bungalow and its meeting hall.

The fact that more power companies have not installed air conditioning in their own office buildings, appliance shops, etc., tells its own story of reluctance to spend money, particularly in hard times, on something on which the industry is not yet even partially sold.

The pioneering which has been done by the companies in St. Louis, Los Angeles and elsewhere by making installations in their own buildings, represents a spirit sadly lacking throughout the industry as a whole during the past few years. That there have been many good reasons to dampen the pioneering spirit is not to be denied, but it must be revived if the traditions of the industry are to be lived up to in the future. Another term for it is just plain, old-fashioned business courage.

It is more than 20 years since you and I ate our first meal in an air-cooled restaurant and saw our first picture show in an air-cooled theater. Textile, cigar and other manufacturers would not think of building a factory without air conditioning installations, entirely irrespective of what the power companies thought about it. Before we know it the thing will be so common in first class railroad travel it will be commonplace.

There is a load-building opportunity for us in air conditioning—not one that will require the construction of new power houses or run into startling earnings—but one which will prove a fair-sized revenue producer. Its development will be rather slow, however, unless the power companies take leadership in the selling job—and the problem in my opinion is primarily that of selling. Whenever we are prepared to put our backs and our dollars into it, and organize major selling efforts, then there will be a real future in air conditioning development.

SERVICE VOLTAGES IN THE UNITED STATES

By G. S. MERRILL*

The manufacturers of incandescent lamps have maintained (with the co-operation of the N.E.L.A. Lamp Committee, until its dissolution) a record of the nominal lighting service voltage in various communities. This data is published in booklet form, by States. About 30,000 communities are now listed in these booklets, which serve primarily as a guide for the distribution of lamps of the proper voltage. In the *N.E.L.A. Bulletin* of September, 1931 (Pg. 627) the Lamp Committee gave an analysis of the Service Voltages for the country as a whole, based on the information given in these booklets at that time. Since then many changes and additions have been made in the data, and an analysis has been made as of June 1, 1933, showing for each State the total population of the communities for which service voltage data is listed, the average voltage for the State weighted according to population served, and the percentage of the population served at various voltages. The average voltage is based on service in the 110-130 volt range only. The analysis is given in Table I.

The following figures show the upward trend in service voltage for the country as a whole.

Per cent Population Listed Served at Different Voltages

Voltage	*1923*	*1928*	*1933*
110	36.3	15.9	5.2
115	40.9	61.6	61.7
120	19.4	22.4	33.0
all others	3.4	.1	.1
	100.0	100.0	100.0
Average (1st 3 items only)	114.1	115.3	116.4

In nearly 100 communities two lighting service voltages are now in use. The use of dual standards in one community greatly complicates the problems involved in the distribution of lamps of correct voltage in the community. As stated in the article in the September, 1931, *N.E.L.A. Bulletin:*

"The Lamp Committee has for several years pointed out the disadvantages of undervoltage operation of lamps, and has urged the unification of voltage wherever conditions would permit for each community." Perhaps it is too much to hope that service voltages throughout the entire country can be brought to one uniform value (at least in the near future) but the eventual unification of voltage in each community may not be beyond the bounds of possible attainment.

*Nela Park Engineering Dept. Cleveland, Ohio.

TABLE I—ANALYSIS OF LIGHTING SERVICE VOLTAGES BY STATES

Division and State	Population of Cities and Towns listed in Voltage Book	Ave. Voltage weighted according to population served	Percentage of Population Listed in Voltage Books Served At 110	115	120	125	130	all others*
New England								
Maine	745,300	115.50	7.2	75.6	17.2	..	..	..
New Hampshire	484,000	116.68	1.4	63.6	35.0	..	..	..
Vermont	318,900	115.40	.7	90.9	8.1	.3	..	..
Massachusetts	4,367,300	114.58	15.0	78.4	6.6	..	..	..
Rhode Island	810,200	115.47	1.1	88.4	10.5	..	..	..
Connecticut	1,668,200	115.34	19.2	54.9	25.9	..	..	..
Middle Atlantic								
New York	11,932,900	118.57	2.9	22.8	74.3	..	..	..
New Jersey	3,808,900	119.09	1.0	16.2	82.8	..	..	..
Pennsylvania	7,713,900	115.19	1.1	94.0	4.9	..	..	..
East North Central								
Ohio	5,245,900	115.74	1.6	82.1	16.3	..	..	..
Indiana	1,825,600	115.09	12.3	74.6	12.5	.3	.3	..
Illinois	6,364,700	115.01	1.0	97.8	1.2	..	..	..
Michigan	3,810,200	117.08	1.5	55.4	43.1	..	..	..
Wisconsin	2,034,400	117.29	3.6	47.1	49.3	..	..	..
West North Central								
Minnesota	1,596,200	116.05	4.2	70.6	25.2	..	..	..
Iowa	1,410,200	113.71	28.2	69.3	2.4	..	..	.1H
Missouri	2,238,100	114.89	2.5	97.1	.4	..	..	..
North Dakota	254,400	115.31	1.4	90.9	7.5	..	..	.2H
South Dakota	272,100	114.96	4.9	91.4	3.3	.4	..	..
Nebraska	700,700	115.16	4.7	87.4	7.7	.1	..	.1H
Kansas	1,006,200	114.21	19.2	77.4	3.3	..	..	.1H
South Atlantic								
Delaware	163,800	118.75	3.2	18.7	78.1	..	..	..
Maryland	1,181,600	118.45	2.4	26.3	71.3	..	..	..
District of Columbia	486,900	115.00	....	100.0	....	..	..	..
Virginia	1,123,800	117.32	2.2	49.1	48.7	..	..	..
West Virginia	837,400	114.98	.6	99.2	.2	..	..	..
North Carolina	1,054,900	115.80	4.9	74.2	20.9	..	..	..
South Carolina	532,600	114.89	5.5	91.2	3.3	..	..	..
Georgia	1,140,800	115.64	3.2	80.9	15.9	..	..	..
Florida	940,100	114.63	7.9	91.7	.3	.1	..	..
East South Central								
Kentucky	1,037,200	116.73	11.0	42.8	45.4	..	..	.8L
Tennessee	1,101,800	115.28	3.6	87.1	9.2	..	..	.1H
Alabama	1,003,100	115.38	2.3	87.8	9.9	..	..	..
Mississippi	554,200	114.91	2.2	97.2	.4	..	..	.2H
West South Central								
Arkansas	548,900	115.19	3.6	92.7	....	3.7	..	..
Louisiana	983,100	117.74	8.4	28.5	63.1	..	..	..
Oklahoma	1,116,600	117.50	5.1	39.7	55.0	..	..	.2L
Texas	3,027,600	117.36	.9	51.4	47.4	.3	..	..
Mountain								
Montana	264,600	115.78	6.0	72.3	21.2	.2	..	.3H
Idaho	209,700	119.42	2.8	6.1	91.1	..	..	..
Wyoming	117,700	114.96	8.6	85.2	4.7	1.5	..	..
Colorado	661,200	116.36	1.1	70.6	28.3	..	..	..
New Mexico	259,400	114.86	3.0	96.0	.2	..	..	.8H
Arizona	233,100	115.96	12.3	56.2	31.5	..	..	..
Utah	396,000	119.43	1.1	9.2	89.7	..	..	..
Nevada	64,400	113.46	30.7	69.3	....	..	..	..
Pacific								
Washington	1,157,600	119.75	.3	4.3	95.3	..	..	.1H
Oregon	631,100	119.68	.4	5.6	94.0	..	..	..
California	4,731,700	116.32	17.8	38.2	43.9	..	.1	..
U. S. Total and Averages	84,169,200	116.40	5.18	61.73	33.01	.05	.01	.02

*H—above 130 L—below 110 Not included in average voltage.

LAMP SALES IN 1932*

Statistics relating to the incandescent lamp industry for 1932 at last began to show the effects of reductions in the use of light. For the first time since 1921, the total lumens of lamps sold declined noticeably (5 per cent) from the preceding year. The quantity of large lamps sold was 7.3 per cent under 1929, the peak year. Altogether the lighting service showed remarkable resistance to depressive influences and, for that reason, should respond profitably to well directed lighting sales and engineering efforts.

LAMP SALES

The total number of large lamps sold in the United States in 1932 was 3.5 per cent less than in the previous year and only 7.3 per cent under the peak year—1929. Of the 335,000,000 large lamps sold in 1932, 334,000,000 were tungsten filament, which quantity was 2.9 per cent less than in the previous year. The large carbon lamp sales decreased markedly during 1932. Details are as shown in Table I.

In the miniature lamp field the total domestic sales increased 0.2 per cent as compared with 1931 (219,300,000 in 1932 and 218,900,000 in 1931). Tables II and III give a detailed comparison for the two years.

The increase in miniature tungsten filament lamp sales was due almost entirely to heavy importation of Christmas Tree lamps. At the same time the imports of carbon filament Christmas Tree lamps dropped sharply.

The sales of Christmas Tree lamps in 1932 (tungsten and carbon combined) represented a total wattage equivalent to 11,389,000, 40 w lamps.

The trend of large lamp sales, and total quantity of lumens represented thereby, is shown in Fig. 1.

*Report of the former Lamp Committee, N.E.L.A. ROBERT B. GROVE, Chairman

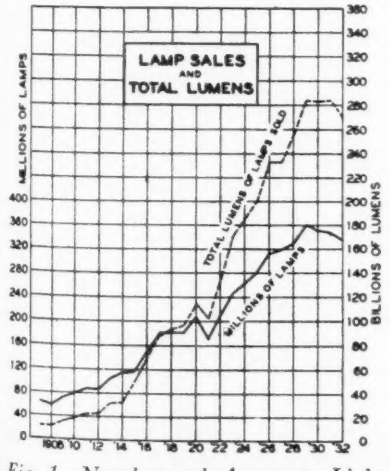


Fig. 1—Number and Aggregate Light Output of Lamps Sold (Excluding Miniature Lamps)

TABLE I—LARGE CARBON LAMP SALES

Item	1932	1931
Total large carbon filament lamps sold in the United States	800,000	2,500,000
Change from previous years, per cent	−68.0	−74.5
Proportion of imported lamps, per cent	22.4	68.0

TABLE II—TUNGSTEN FILAMENT MINIATURE LAMP SALES

Service	1932	1931
Flashlight	35,908,000	33,262,000*
Automobile	83,260,000	94,702,000
Christmas Tree	89,970,000	75,710,000
Miscellaneous	9,793,000	14,004,000*
Total	218,931,000	217,678,000

*Adjusted between services starred.

TABLE III—CARBON FILAMENT MINIATURE LAMP SALES

Service	1932	1931
Christmas Tree	14,000	135,000
Miscellaneous	333,000	1,028,000
Total	347,000	1,163,000

AVERAGE LUMENS, WATTS AND EFFICIENCY OF LAMPS

Table IV gives the average lumens, watts and efficiency (lumens per watt) of the large lamps sold during each of the past three years.

Fig. 2 presents the data in graphic form, going back to the year 1907.

TABLE IV—AVERAGE LUMENS, WATTS AND EFFICIENCY OF LAMPS SOLD
(Excluding Miniature Lamps)

	1932	1931	1930
Average lumens	804	817	814
Average watts	59.0	60.9	61.2
Average lumens per watt	13.6	13.4	13.3

TABLE V—DEMAND BY VOLTAGE GROUPS

Group	1932	1931	1930
115 v	91.9%	91.3%	91.5%
230 v	1.7	2.1	2.5
Street series	2.1	1.9	1.7
Street railway	1.2	1.4	1.3
30 and 60 v	1.7	1.7	2.3
*Miscellaneous	1.4	1.6	0.7
Total	100.0%	100.0%	100.0%

*Includes Photoflash lamps.

The data given in Tables IV to XI and Figs. 2 to 6, all inclusive, refer to large Mazda lamps and Type D lamps.

DISTRIBUTION BY VOLTAGE

Table V gives the distribution of large lamp sales by voltage groups.

Table VI and Fig. 3 give further details of the distribution in the 100-130 v range.

The demand for 120 v lamps continues to increase. From a recent analysis of the Service Voltages in the United States it appears that the rela-

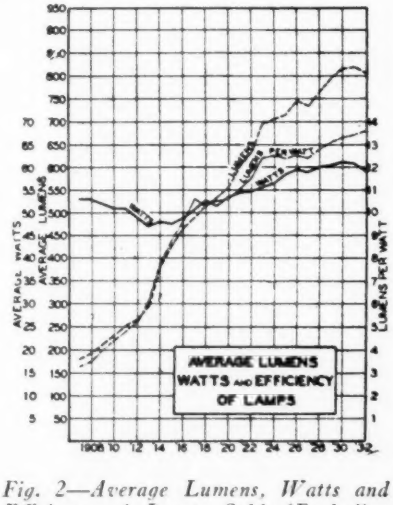


Fig. 2—Average Lumens, Watts and Efficiency of Lamps Sold (Excluding Miniature Lamps)

TABLE VI—DISTRIBUTION OF LAMPS BY VOLTAGE WITHIN THE 100-130 V RANGE

Volts	*1932*	*1931*	*1930*
100, 105	...	...	0.1%
110	3.0%	3.7%	5.2
115	46.2	48.0	48.9
120	46.0	43.9	41.3
125	3.7	3.3	3.5
130	1.1	1.1	1.0
Total	100.0%	100.0%	100.0%
Aggregate 110, 115 and 120 v	95.2%	95.6%	95.4%

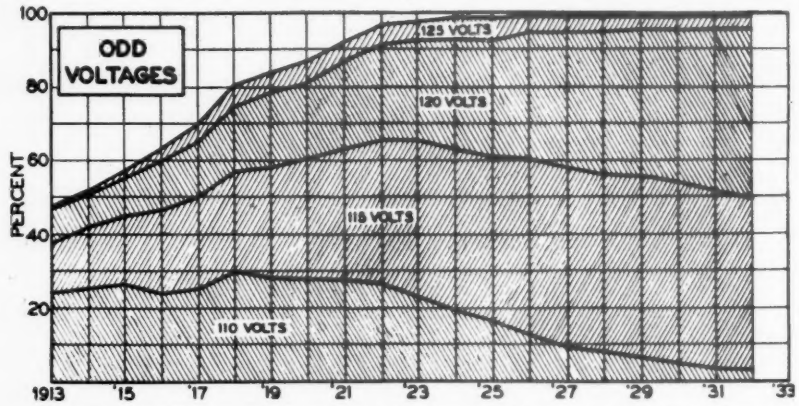


Fig. 3—Distribution of Lamps by Voltage Within the 100-130 V Range

TABLE VII—DEMAND FOR LAMPS BY SIZES

	1932	*1931*	*1930*
7½ w	0.4%	...	...
10 w	3.0	3.7%	4.0%
15 w	7.4	5.7	5.3
25 w	18.4	22.1	23.8
30 w	6.7	2.4	...
40 w	10.9	12.4	12.5
50 w	9.9	11.7	13.6
60 w	20.9	16.9	15.9
75 w	3.0	3.3	3.1
100 w	8.5	9.4	10.4
150 w	2.8	2.9	3.1
200 w	3.1	3.4	3.7
250 w	0.1	0.1	...
300-1,000 w	1.1	1.2	1.3
Street railway	1.3	1.5	1.4
Street series	1.5	1.6	1.6
*Miscellaneous	1.0	1.7	0.3
Total	100.0%	100.0%	100.0%

*Includes Photoflash lamps.

TABLE IX—DEMAND FOR REGULARLY LISTED STREET SERIES LAMPS BY SIZES

Lumens	*1932*	*1931*	*1930*
1,000	45.5%	43.8%	45.1%
2,500	24.0	24.4	24.2
4,000	13.3	14.4	14.4
6,000	13.5	12.5	11.9
10,000	3.0	2.9	2.7
Miscellaneous	0.7	2.0	1.7
Total	100.0%	100.0%	100.0%

TABLE X—DEMAND FOR STREET SERIES LAMPS BY AMPERE RATING

	1932	*1931*	*1930*
4.0 amp	0.9%	1.5%	1.8%
5.5 amp	1.2	1.4	3.1
6.6 amp	72.7	72.2	71.2
7.5 amp	9.4	8.7	9.0
Compensator	15.6	16.0	14.6
Miscellaneous	0.2	0.2	0.3
Total	100.0%	100.0%	100.0%

TABLE VIII—PER CENT OF TOTAL WATTAGE OF LAMPS SOLD

	1932		*1931*		*1930*	
7½	0.1%		...		...	
10	0.5		0.7%		0.7%	
15	2.0		1.5		1.4	
25	8.3		9.8		10.2	
30	3.6		1.3		...	
40	7.8		8.8		8.5	
50	9.0		10.4		11.6	
60	22.6		17.9		16.3	
75	4.1		4.4		4.0	
100	15.3		16.7		17.8	
***125	0.0+		0.0+		...	
150	7.6		7.6		7.8	
200	11.0		11.9		12.5	
250	0.4		0.5		...	
300	3.9	7.7	4.1	8.5	4.4	9.2
*360	0.1		0.1		0.1	
**400	0.1		0.1		0.1	
500	2.0		2.4		2.8	
750	0.3		0.4		0.5	
1000	1.0		1.1		1.3	
1500	0.3		0.3		...	
Total	100.0%		100.0%		100.0%	

*Sunlight (S-1) lamp.
**Proj. lamp.
***Sunlight (S-2) lamp.

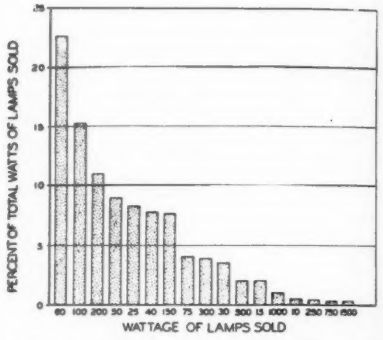


Fig. 4—Per Cent of Total Watts of Lamps Sold

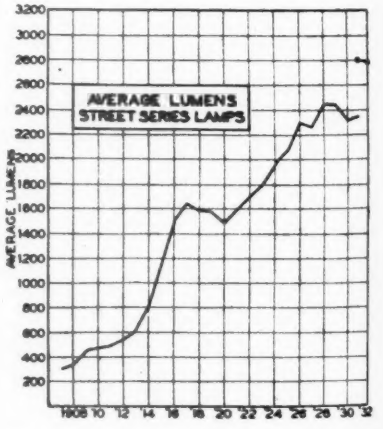


Fig. 5—Average Light Output of Street Series Lamps Sold

tive demand for 120 v lamps (46.0 per cent) is greatly in excess of the percentage of the population within com-

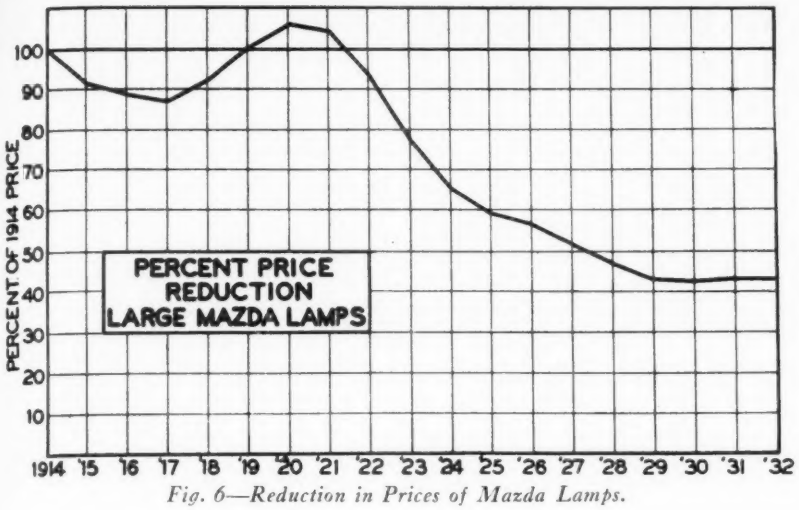


Fig. 6—Reduction in Prices of Mazda Lamps.

munities served at that voltage (about 33 per cent of the total). The manufacturers are endeavoring to eliminate the under-voltage operation of lamps that results from the shipment of lamps at voltages higher than the standard lighting voltage of the community in which they are used. The problem of lamp manufacturers in controlling the shipment of correct voltage lamps into every community is rendered difficult in some cases by the non-uniformity of voltage in these communities. The member companies can be of great assistance in furthering this program by reducing the spread between maximum and minimum voltages.

DEMAND BY SIZES

The relative demand for the principal sizes of lamps is shown in Table VII. The decrease in relative demand for multiple lamps above 75 w in size results largely from the decline in industrial activity.

The distribution according to the total wattage each size represents is as shown in Table VIII and Fig. 4. Five sizes (60, 100, 200, 50 and 25 w) account for approximately two-thirds of the total wattage of all the large lamps sold last year.

STREET SERIES LAMPS

Fig. 5 shows the average light output of street series lamps sold each year since 1907. Two figures of average lumens are shown for 1931. The lower value is comparable with the previous years. The higher values (indicated by two dots) exclude from consideration the sizes below 1000 lumens, which no longer appear on the standard schedules. Table IX showing demand for street series lamps, excludes sizes below 1000 lumens for this reason.

PRICE CHANGES

No price changes in the standard line previously reported upon had been made as of January 1, 1933. In Fig. 6 the average trend of prices is shown graphically. No change in price for 1932.

ACCIDENT PREVENTION

For 20 years the accident prevention work of the Electric Light and Power Industry was carried on through the Accident Prevention Committee of the National Electric Light Association. With the dissolution of that organization all of its committees went out of existence.

With the formation of the Edison Electric Institute, a new committee structure was organized with all of the committees of the Engineering Section of the former N. E. L. A. being succeeded by three technical committees, each of which combines the activities of two or more of the former engineering committees. The work of the Accident Prevention Committee was not assigned to any particular one of these three committees, but was divided among the three so that each will deal with the safety problems that fall within their respective scopes with the necessary coordination to insure an effective and efficient continuation of the industry's accident prevention work.

This disposition of the activities of the Accident Prevention Committee should not be taken to mean that interest in safety matters by this industry has decreased. The excellent work done by the Accident Prevention Committee will serve as an objective to increased efforts to further reduce the frequency and severity of accidents to the public and employees concerned with the electric light and power industry.

The Edison Electric Institute will continue the collection of accident statistics for the industry and endeavor to coordinate its safety activities with those of other organizations where problems of mutual interest arise.

TABLE XI—PRICE TABLE SHOWING DATES OF INTRODUCTION OF MAZDA LAMPS, ORIGINAL LIST PRICES AND CHANGES TO DATE LAMPS FOR GENERAL LIGHTING SERVICE—110, 115 AND 120 V

Size in watts	10	15	25	40	50(B)	50(C)	60	75	100	150	200	300	500	750	1000	1500
Date of introduction	June 1912	Mar. 1912	Oct. 1908	Nov. 1907	July 1916	Oct. 1919	Nov. 1907	July 1916	April 1915	April 1917	Oct. 1914	Oct. 1914	July 1914	April 1914	April 1914	Mar. 1931
Original list price	$0.50	$0.50	$0.85	$1.50	$0.28	$0.65	$1.75	$0.65	$1.00	$1.50	$3.00	$4.00	$6.00	$6.50	$8.00	$5.75
Price as of Jan. 1, 1910	...	...	.70	.80	...	...	1.10	...	...	...	...	...	...	...	...	...
Jan. 1, 1915	.30	.30	.30	.30	...	...	.40	...	...	...	3.00	4.00	6.00	6.50	8.00	...
Jan. 1, 1920	.35	.35	.35	.35	.35	.65	.40	.70	1.10	1.65	2.20	3.25	4.70	6.50	7.50	...
Jan. 1, 1925	.27	.27	.27	.27	.27	.40	.32	.45	.50	.65	.80	1.25	2.00	3.50	3.75	...
Jan. 1, 1929	.20	.20	.20	.20	0.22		.22	.35	.35	.60	.80	1.25	2.00	3.75	4.00	...
Jan. 1, 1930	.20	.20	.20	.20	.20		.20	.35	.35	.60	.80	1.25	2.00	3.75	4.00	...
Jan. 1, 1931	.20	.20	.20	.20	.20*		.20	.35	.35	.60	.80	1.25	2.00	3.75	4.00	...
Jan. 1, 1932	.20	.20	.20	.20	.20*		.20	.35	.35	.60	.80	1.25	2.00	3.75	4.00	5.75
Jan. 1, 1933	.20	.20	.20	.20	.20*		.20	.35	.35	.60	.80	1.25	2.00	3.75	4.00	5.75

The standard line of inside frosted lamps of 15, 25, 40, 50, 60 and 100 w was introduced February, 1926, to which the 75 w lamp was added March 30, 1930.

*Removed to intermediate schedules March 1, 1931.

SUGGESTED STANDARD PACKAGES FOR OVERHEAD LINES MATERIAL*

This report presents a suggested standardization of packages for materials for overhead line construction. It gives definite quantities and types of packages for all materials for which suggested standards had been published previously by the N.E.L.A., together with a few others, these being the materials most commonly used. A general standard for weight and preferred numbers of pieces for standard packages is also included.

The advantages to be gained from the establishment of a national standard for packages for overhead line material is almost self evident. Both the manufacturer and the purchaser will gain in the facilitation in ordering, handling, and warehousing of these materials if uniform standards of package quantities are adopted. The work of formulating such a list of standards was undertaken about three years ago by the Subcommittee on Hardware, Insulators and Wire of the Overhead Systems Committee, Engineering National Section, N.E.L.A., in connection with its work on standard designs for overhead line materials. Cooperation with the manufacturers was secured by membership on the Subcommittee of representatives of three of the larger manufacturers of line hardware. Other manufacturers of hardware and porcelain also were consulted. Since this is the first report of this kind to be published, it was decided not to attempt to cover all items of line material manufactured but to limit the scope to the items for which standard designs have previously been published under the auspices of the Overhead Systems Committee. A few other allied items which seemed essential are included.

No attempt was made to standardize the form or size of containers. Only the general type suitable for use with any item is indicated. It was thought to be beyond the scope of this report to go further than this.

It is to be hoped that manufacturers and purchasers will generally adopt this list of standards as it can only be of full value if universally used.

* A report of the former Overhead Systems Committee, Engineering National Section, N.E.L.A., MERRILL DEMERIT, *Chairman*. Prepared by the Subcommittee on Hardware, Insulators and Wire, HOWARD P. SEELYE, *Chairman*.

(N.E.L.A. Suggested Specification Number D-999-32T)

SUGGESTED STANDARD PACKAGES FOR OVERHEAD LINES MATERIAL

Material	Suggested N.E.L.A. Spec. No.	Standard Package	Approximate Weight, Lb.
Anchor Plate (Cone Anchors) 8″	D-430-28T	5 (Max.) in Bundle	30
" " (" ") 12″	D-431-28T	2 (Max.) in Bundle	30
Anchor Rod, 5/8″ x 6′	D-261-24	10 " "	65
" " 5/8″ x 6′	D-261-24	10 " "	85
" " 3/4″ x 8′	D-262-24	5 (Max.) in Bundle	65
" " 3/4″ x 10′	D-262-24	5 (") " "	85
" " 1″ x 10′	D-263-23	2 (") " "	60
" " 1″ x 12′	D-263-23	2 (") " "	65
Bolt—3/8″ Carriage, 3″ to 6″	D-235-22	500 in Box	65 to 110
" —3/8″ Machine, 3″ to 6″	D-240-22	500 in Box	60 to 110
" —1/2″ " up to 6″	D-243-22	250 " "	up to 105
" —1/2″ " 7″ and 8″	D-243-22	200 " "	95 to 105
" —1/2″ " 9″ and over		100 " "	60 to 115
" —5/8″ " up to 14″	D-246-22	50 " "	up to 65
" —5/8″ " 16″ and over	D-246-22	50 " "	70 to 110
" —3/4″ " 8″ to 18″	D-248-31T	50 " "	55 to 110
" —3/4″ " 20″ and over	D-248-31T	25 " "	60 to 85
" —5/8″ Double Arm, 14″ to 24″	D-250-22	50 " "	80 to 115
" —1/2″ Eye, 6″ to 20″	D-255-23	100 " "	55 to 125
" —5/8″ Eye, 6″ to 24″	D-257-23	50 " "	45 to 115
" —1/4″ Expansion, 1 3/4″ to 2 1/2″	D-330-28T	100 " "	7 to 10
" —1/2″ Expansion, 2 1/2″ to 4 1/2″	D-332-28T	50 " "	20 to 30
Brace—Alley Arm, 5′ and 7′	D-225-28T	5 (Max.) in Bundle	65 to 90
" —Flat Cross Arm, 20″ and 28″	D-220-28T	20 in Bundle	35 to 50
" —Angle Cross Arm, 37″ to 60″	D-230-28T	5 (Max.) in Bundle	35 to 55
" — " " " 72″	D-231-27	5 (") " "	80
" —26″ Vertical	D-227-22	5 (") " "	20
" —50″ "	D-228-22	5 (") " "	40
Bracket—Service, 12″ and 18″	D-910-28T	25 in Box, Assembled with Insulators	65 to 95
Clevis—(Eyelet)	D-309-23	100 in Box	95
" —Pressed Steel, Split	D-322-28T	100 " "	70 to 85
" —Drop Forged, One-piece	D-324-28T	100 " "	65 to 135
Driving Point	D-415-22	100 in Box	55 to 65
Eye Nut	D-308-22	100 " "	50
Guard—Pole, 14″ x 18″ x 1/8″	D-283-22	5 (Max.) in Bundle	50
" — " 16″ x 18″ x 1/8″	D-283-22	5 (") " "	50
Guy Clamp, 3-bolt, 6″	D-285-27	50 in Box	115

SUGGESTED STANDARD PACKAGES FOR OVERHEAD LINES MATERIAL

(*Continued from preceding page*)

Material	Suggested N.E.L.A. Spec. No.	Standard Package	Approximate Weight, Lb.
Guy Clip, 3/8"	D-290-22	250 in Box	80
" " 1/2"	D-290-22	100 " "	65
Guy Hook, 1 3/4" x 3/8" x 4", 1-bolt	D-295-24	100 " "	90
Guy Plate, 4" x 8" x 5/64"	D-298-28T	100 " "	75
" " Moulding, 4" x 8" x 5/64"	D-299-28T	100 " "	75
Guy Wire Protector, 8'	D-282-28T	2 to 5 (Max.) in Bundle Depending on Type	35 to 75
Insulator—Side Groove Pin (Porc.)	D-510-23	50 in Carton (or Box)	65
" —Top " " (")	D-511-23	50 " " (" ")	100
Insulator—Side Groove Pin (Glass)	D-590-23	50 in Carton (or Box)	70
" —Top " " (")	D-591-23	50 " " (" ")	110
" —Guy Strain, Standard	D-560-23		
Small		50 " " (" ")	60
Medium		50 " " (" ")	90
Large		25 " " (" ")	80
Insulator—Guy Strain, Multifin	D-570-28T		
Small		50 in Carton (or Box)	65
Medium		25 " " (" ")	65
Large		25 " " (" ")	100
Insulator—Spool, Small	D-580-23	100 " " (" ")	50
" — " Large	D-581-23	50 " " (" ")	70
Lag Screw—1/4", up to 2 1/2"	D-264-28T	2000 in Box (50 in each paper box)	up to 65
" " —3/8", up to 3 1/2"		1000 " " (50 " " " ")	up to 110
" " —3/8", 4" and over	D-264.1-28T	500 " " (50 " " " ")	60 to 90
" " —1/2", up to 4 1/2"	D-265-22	500 " " (50 " " " ")	80 to 125
" " —1/2", 5" and over		250 " "	70 to 95
" " —5/8", all lengths	D-266-22	250 " "	85 to 125
Molding—1", Ground Wire, 8' long	D-190-24	25 in Bundle	15
Pin, Wood, 1" x 9"	D-160-22	250 in Bag	100
" Steel, Lag Screw Type, 1"	D-340-28T	100 in Box	90
" " Machine Bolt Type, 1"	D-340-28T	50 in Box	50 to 80
" " Medium Voltage	D-350-28T	10 or 25 in Box, Depending on size	75
" Pole Top, Pipe	D-355-28T	5 (Max.) in Bundle	30
Pole Step, 5/8" x 10"	D-280-22	100 in Box	90
Ridge Pin Support	D-362-28T	5 (Max.) in Bundle	40
Secondary Rack	D-920-28T	5 (Max.) in Bundle without Insulators	75 to 100
Splicing Sleeve, No. 10 to No. 6 Solid	D-950-28T	100 in Carton	5 to 8
" " No. 4 Solid and No. 5 Stranded	D-950-28T	50 " "	7
" " No. 3 to No. 0 Solid, No. 4 to No. 0 stranded	D-950-28T	25 " "	5 to 15
" " No. 00 to 250 M.c.m. stranded	D-950-28T	10 " "	8 to 17
Spool Strap	D-320-24	50 in Box (including insulators)	100
Staple, 2" and 3"	D-315-22	100 in Box	4 to 7
Thimble, 3/8"	D-300-22	1000 in Box (50 in each paper box)	100
" 1/2"	D-300-22	500 " " (50 " " " ")	105
" 5/8"	D-300-22	250 " "	100
Washer—Round 7/16" x 1"	D-270-28T	5000 " " (500 " " " ")	80
" — " 1/2 x 1 1/4"	D-270-28T	3000 " " (300 " " " ")	90
" — " 9/16" x 1 3/8"	D-270-28T	2000 " " (200 " " " ")	85
" — " 11/16" x 1 3/4"	D-270-28T	1000 " " (100 " " " ")	75
" — " 13/16" x 2"	D-270-28T	1000 " " (100 " " " ")	110
" —Square, 2 1/4" x 2 1/4" x 3/16" for 5/8" bolt	D-275-24	500 " "	120
" — " 4" x 4" x 3/16" for 3/4" bolt	D-276-24	100 in Box	85
" —Anchor Rod, 3" x 3" x 1/4"	D-276-24	100 in Box	60
" — " " 4" x 4" x 1/2"	D-276-24	50 " "	100
Wire Holder	D-900-28T	50 in Carton	45

DEFINITIONS

Bag = Burlap bag.
Box = Wooden box, may be bound with wire or metal strip.
Carton = Paper box.
Bundles to be tied with wire.

1. In general the weight of standard packages should be about 100 pounds, except in the cases of comparatively light but bulky articles.
2. The number of pieces in the standard package ordinarily should be 2, 4, 5, 25, 50, 100, 200, 250, 500, 1000, 2000, or 5000.
3. Sizes other than those of the N.E.L.A. suggested standards are shown in this list in some cases.
4. In the case of heavy items such as anchor plates, anchor rods, alley arm braces, guy protectors, pole guards, etc., for which the quantity given for the standard package is 5 or less, these quantities should be considered as maximums and the items may be shipped singly if desired by the manufacturer or requested by the purchaser.

DEVELOPMENTS AND TRENDS IN POWER STATIONS

By FRANK S. CLARK

Consulting Engineer, Stone & Webster Engineering Corporation

Address Before the Second Session of the First Convention of the Edison Electric Institute, Chicago, Ill., June 6, 1933.

During the past ten years we have witnessed a phenomenal increase in the number and capacities of steam power stations and of their individual units. The grouping of individual properties into large systems and the interconnection of these systems have aided in this development. The enthusiasm of the times was to think and do large things and this, combined with a natural desire among engineers to be just a little ahead of the other fellow, is responsible for the progress that has been made.

But, to paraphrase a well-known poem, "That's all left behind us, long ago and fur away, and there ain't no power stations for us to build today." And we have a beautiful opportunity to survey our accomplishments and see which way we are heading.

Beginning with the increase in steam pressures and temperatures and the adoption of the regenerative cycle about ten years ago, the efficiency of steam-electric power production began rapidly to increase.

The addition of the reheat cycle, first with 650-lb. pressure and then with 1400-lb. pressure, aided in this improvement but with increased complication and, for the same installed capacity, at increased capital cost. In 1923 the first commercial installation of the binary mercury-steam cycle was made at Hartford and was quick to show its efficiency possibilities.

Figure I shows graphically when and where the improvements in efficiency have been made. The curves represent the averages of a number of typical stations and not individual best performances.

To my mind the more important trends which may aid us in our effort to install a kilowatt for a reasonable investment, to produce a kilowatthour at a minimum cost, and to live at peace with the community, are as follows: (These are not necessarily in the order of their relative importance.)

1. Higher rates of steam generation.
2. An approach to the unit arrangement of one boiler per turbine generator.
3. Increased capacity of single-shaft turbine generators.
4. The so-called "open air" station or the omission of housing for certain items of power-station equipment.
5. Simplification in electrical equipment and wiring.
6. The use of higher steam temperatures and pressures.
7. The increasing use of pulverized coal as fuel for large-capacity boilers.
8. The installation of combustion equipment to utilize liquid and gaseous fuels as well as coal and to change from one fuel to another without material cost or rearrangement of furnace or fuel-burning equipment.
9. The mercury-vapor-steam-electric generating station.
10. Reducing the amount of cinder and dust discharge from power station chimneys.
11. The prevention of turbine oil fires.
12. The rehabilitation of existing old power stations.
13. The supply of both steam and electric energy to an industry or group of industries.

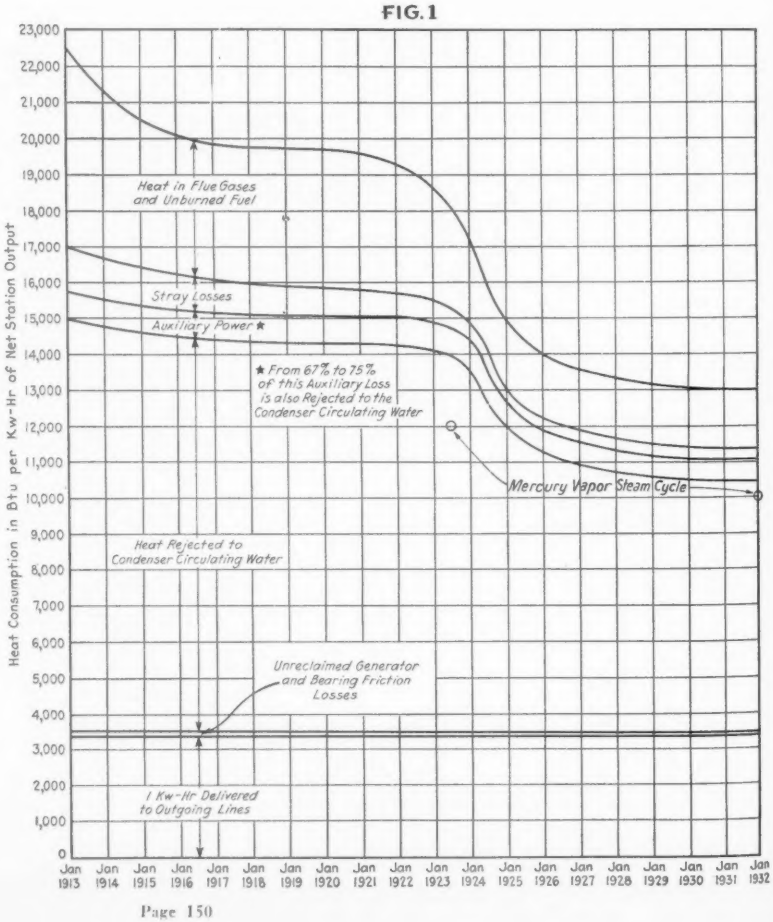
Higher Rates of Steam Generation

The advent of the liquid cooled furnace wall permitted greatly increased rates of heat liberation in the furnace, particularly with fuels that are burned in suspension. This has resulted in increasing the steaming capacities of individual units with consequent decrease in their unit cost. The arrangement and dimensions of the units have changed requiring less ground or building area. Using the sectional header type boiler as an example, a few years ago 7500 lb. of steam per header per hour was considered reasonable. One station now building is designed for 12,000 lb. per header per hour and designs have been made for steaming rates of from 15,000 lb. to 18,000 lb.

Unit Arrangement

Due to the improvements in heat generating and absorbing equipment and in treatment of feed water, the serviceability of boiler room equipment is now

FIG. 1



equal to that of the turbine room. These have made feasible the so-called "Unit Arrangement" of one steam generating equipment to serve one turbine generator. This arrangement permits of great simplification if applied also to the relatively minor items such as piping and auxiliary equipment. Made rugged, and carefully designed, the unit arrangement will have as few, if not fewer troubles than a more complicated interconnected layout. Our organization is now designing and constructing such a station with 35,000 kw units. The new Port Washington Station of the Milwaukee Electric Railway, Light & Power Company is being built on this principle with 80,000 kw units. It is easily applicable to units of 100,000 kw and over, and one station is now projected in which the generating units will be of 200,000 kw capacity.

The unit arrangement lends itself best to a large metropolitan or to an interconnected system where spare generating capacity need not be carried in each station. I am convinced that it offers opportunities for real savings in investment cost.

Capacities of Turbine Generators

There is installed at State Line a cross-compound, three unit, turbine generator of 208,000 kw capacity which is a world's record. Since its installation manufacturers have become able to build larger capacity generators and there are now running at Hudson Avenue two 160,000 kw tandem compound units, and one of like capacity and type is being built for the Philadelphia Electric Company. With the proved reliability of the large single shaft units it appears that future developments would be along this line. They should cost less and occupy much less space than the cross-compound units. It is interesting to note that the next two units at State Line are to be single shaft units of about 150,000 kw capacity each.

There are installed several 3600 rpm turbine generators of from 15,000 kw to 18,000 kw capacity. These are mostly high pressure (650 lb.) noncondensing units. Manufacturers are offering condensing units for this speed up to 25,000 kw capacity. They are more efficient and take less space than the 1800 rpm units. I am told also that their cost would be less.

"Open Air" Stations

It is now common practice to place high tension transformer, bus and switching equipment outdoors with a consequent saving in housing. The same thing is being done with synchronous condensers and water wheel generators. There has been increasing talk of omitting the building structure over certain mechanical equipment and some engineers are advocating the so-called "outdoor" station, in which only the sections essential to the operating functions of the plant are enclosed. One such station is now in partial operation at Schenectady. The General Electric Company and Mr. Smith, who designed the station, did not go the limit with this first installation and placed only the turbines, and some portions of the boiler room equipment outdoors. This will give a good idea of the practicability of the scheme and leave the way clear to its further development as experience proves feasible.

The maintenance of such a plant, and provision against freezing, particularly in cold climates, are the principal problems. Opinions of both engineers and operators differ as to the extent it is desirable to go along this line and I would suggest that you analyze carefully the costs of the two types of station in comparison with their advantages and disadvantages.

There is, however, a decided tendency toward the omission of as many interior walls and partitions as possible and the centralization of control equipment for both turbine and boiler room equipment.

Simplification in Electrical Equipment

There is a marked tendency toward simplification and reduction in cost of electrical equipment.

Large size generators are being built with double windings which have permitted the installation of oil circuit breakers of lower interrupting capacity and reduction in the use of bus reactors.

Generators are in operation in this country at 22 kv, and in Europe at 33 kv and 36 kv. The higher generating voltages result in a reduction of the current rating of buses and oil circuit breakers and require fewer feeder oil circuit breakers with a corresponding less cost of switch gear, wiring and building structure.

Developments have recently been made in the design of oil circuit breakers resulting in greatly increased reliability and interrupting capacity with less space requirements, giving a consequent reduction in building cost. High speed oil circuit breakers are being installed to improve selectivity and reliability of service.

There is a tendency toward the use of fully insulated buses and connections permitting closer spacing of equipment, giving improved reliability and freedom from communication of electrical failures.

Installations have been made of the so-called metal clad switch gear with oil insulated buses. This type of gear is admirably adapted to outdoor use.

Consideration is being given to the use of multiple winding auto-transformers in order to reduce the amount of switch gear required for large capacity stations.

Where the bulk of the energy is transmitted from the generating station at a voltage higher than that at which it is practical to generate, there is a tendency to eliminate buses and switching at generator voltage, using step-up transformers connected directly to the generator leads.

There is an almost universal use of all electric drive auxiliaries. The use of metal clad switch gear for this service is rapidly gaining in favor.

The development of vacuum tube equipment for power station service is well advanced. If this development becomes practical for large capacities there will be a very radical change in the design, and possibly a material reduction in the cost of the main switch gear and wiring of power station.

Higher Steam Temperatures and Pressures

Increasing the steam temperature permits adopting a higher steam pressure and extends the range of use of the regenerative cycle with better efficiencies and small incremental costs. When it becomes desirable to use a pressure that is beyond the safe temperature limit the addition of the more complicated reheat cycle becomes essential with consequent greater construction cost. Increasing the steam temperature, however, makes more feasible the use of steam instead of flue gas reheat with consequent decrease in investment cost of this cycle.

Several stations are now operating in this country at 850 deg. Fahr. and the corresponding economical pressure of 650 lb. Others are to follow. In the higher pressure range using the reheat cycle, one installation has been made and two are in progress, where the temperature will be 850 deg. Fahr and the initial pressure 1400 lb.

There has been in operation for some time now a 10,000 kw, 450-lb. pressure turbine generator in the Delray Station at Detroit. This unit has run for over 5600 hr. at a temperature of 1000 deg. Fahr with perfect success. The conclusion which the company's engineers draw

from their experience is that it is feasible to design a plant that will operate satisfactorily at 1000 deg. Fahr. provided proper materials are used. They have not worked out the economies involved and therefore do not state whether the investment is at present justified.

One manufacturer has stated his readiness to build turbine generators for 1000 deg. Fahr. steam temperature up to 200,000 kw capacity on one shaft. The unit would operate at an initial pressure of 1200 lb. using the regenerative cycle without reheat.

There are operating abroad three boilers which generate steam at the so-called "critical" pressure of 3200 lb. One of these at Langerbrugge in Belgium has a capacity of about 300,000 lb. of steam per hour. In this country, Purdue University has installed a small boiler in which the pressures can be varied from 1500 lb. to 3500 lb. Experiments are being conducted on this boiler to learn more about the properties and action of steam at these extremely high pressures.

The Purdue experiments will be watched with interest, as it is possible that in the future there may be developed a use and demand for extremely high pressure steam generation.

Increasing Use of Pulverized Coal

Pulverized coal is being used for fuel in the furnaces of most of the modern large capacity boilers. The stoker installations at Delray and Hudson Avenue are the notable exceptions. There is a decided trend toward the use of the unit system with two or more mills per boiler. Some operators prefer a small amount of pulverized coal storage such as was installed at Burlington. As between the unit and the storage system, for the same character of coal there appears to be little choice as to efficiency and power consumption.

The slag bottom furnace is being adopted more generally when the fusing temperature of the ash permits. With this furnace the vertically inclined burner as developed at State Line is coming into use.

Combination Burners

Rapid extension of natural gas lines has made this fuel available for steam generation at greater distances from the gas fields. Fuel oil prices, especially along the seacoast, have become attractive. Equipment has been developed for the combustion of gas, fuel oil and pulverized coal in the one burner and there is a growing use of this equipment. There is an appreciable saving in initial investment cost if plant operation can be started with fuel oil or gas with provision for the installation of pulverized coal when the price differential warrants. There is an advantage also after the two fuels have been provided for in negotiating new fuel contracts.

Binary Vapor Cycle

The initial commercial installation of a mercury boiler and turbine at Hartford is now over ten years old. This paved the way for the second unit of 10,000 kw capacity in the South Meadow Station of the same company, which is producing a net kilowatthour on about 10,000 Btu.

Two additional installations are being made, one in the Kearny Station of the Public Service Electric & Gas Company and the other in the "open air" plant of the General Electric Company at Schenectady. The Kearny unit is now in operation. Each mercury unit has a capacity of 20,000 kw and they are alike except that at Kearny the turbine unit is above the mercury boiler, while at Schenectady it is at the usual turbine room floor level, which requires a pump to feed the condensed mercury back to the boiler. The operation of these installations will be watched with interest as affording an additional possibility of increased economy.

Binary vapor cycles using other vapors than mercury have been suggested, but at present they are the subject only of theoretical discussion.

Reducing the Amount of Cinders and Dust in Stack Gases

Increased rates of fuel consumption have aggravated the situation in regard to cinder and dust discharged from power station chimneys. Agitation has abated somewhat due to decreased municipal budgets omitting provision for "smoke inspection," but it behooves the engineer and his company to bear the subject in mind. The slag bottom furnace with vertically inclined pulverized fuel burners will prevent from 35 to 40 per cent of the ash in the coal from leaving the furnace. To catch the remainder, the electrostatic precipitator has so far proved the most satisfactory and the most expensive to install. Both spray and film type wet eliminators are being installed also. They reduce gas temperatures sometimes below the dew point and introduce the uncertainties of corrosive action.

At high fuel burning rates it is possible to have more cinders discharged from the stack of a stoker fired plant than dust from a pulverized fuel plant using the best types of eliminators in each case. Stoker cinders are larger and contain more carbon than pulverized fuel dust. This militates against the electrostatic precipitator which, to my knowledge, has not been applied to a stoker installation. The eliminators at Hudson Avenue are the most efficient for stoker plants that have come to my attention.

Turbine Oil Fires

During the past year there have been three disastrous fires due to the ignition of turbine oil by contact with hot steam pipes. The danger from such fires has increased with steam temperatures. The manufacturers and utility engineers are awake to the situation and new units will have this hazard reduced to a minimum. On the 165,000-kw turbine for Richmond Station it is proposed to use a noninflammable liquid for governor actuation and minimize the amount of lubricating oil piping and placing it remote from hot steam pipes.

On the new unit for the Potomac Electric Power Company the oil tank and coolers are in a fireproof room with all pressure pipes run inside the drain pipes which are welded and without joints. The arrangement is considered by the manufacturers to be safe and fireproof.

Rehabilitation of Existing Stations

The developments in steam generation which have been mentioned afford a possible means of adding to the capacity and increasing the efficiency of existing old stations by the installation of high pressure boilers with noncondensing turbines exhausting into the present steam mains.

This has been done at the Burlington Station by adding an 18,000 kw turbine with a 650 lb., 850 deg. Fahr. boiler, while at San Antonio a 1400-lb. boiler and an 8000-kw turbine have been added. The mercury boiler and turbine at South Meadow Station accomplish the same purpose.

One large utility is planning to remove its old 225-lb. pressure boilers and substitute 650-lb. pressure units.

Combined Utility and Industrial Power Plants

The past few years have seen a change in regard to the supplying of electric power to industries, and in order to furnish or to continue to supply such electrical requirements it is often advisable and sometimes necessary to cooperate with an industry or group of industries and furnish both their steam

and electrical needs. By so doing it is frequently possible to effect a saving in investment as well as in operating cost.

This situation has been brought about by the growth of the industries, by their ability to employ highly trained men, by the obsolescence of their boiler plants and by the increase in steam temperatures and pressures which permits the generation of by-product electric power.

The operation of plants for this purpose is logically the function of the utility company which can absorb in its system surplus electric power, and furnish such power when there is a deficiency in that produced by the steam demand. There are instances where the industry has waste heat or products which can be sold to the utility for steam generation.

Each case is different and presents its own problems, but the situation must be such, however, that a saving will result from the combination of the two services and requirements. Then the contract made must be such that there will be an equitable division of the savings effected, all factors being considered.

The Louisiana Steam Generating Corporation at Baton Rouge, although not a utility, furnishes an interesting example of such an arrangement. This is a separately incorporated company, and its plant furnishes a million pounds of steam per hour to a local refinery. It furnishes also all electrical energy to the refinery, and purchases its burnable waste fuels up to a certain percentage of the total heat requirements of the power station. Surplus electrical energy is disposed of to the local utilities. The plant consists of five 670-lb pressure boilers and three 15,000-kw turbine generators exhausting at 140-lb. pressure. There are seven classes of fuel burned in the plant, including natural gas and petroleum coke.

Conclusion

I have endeavored to give you a condensed statement of where power station development stands and of what seems to me to be before us. My remarks are not necessarily predictions, for as a prophet I cannot qualify even as a minor one. I shall appreciate any comments which you may care to make. I thank you.

DISCUSSION OF MR. CLARK'S PAPER

BY W. S. MONROE
Sargent & Lundy

Yesterday I was sitting next to the vice president of one of the important electric power companies and he said, "I see you are going to discuss Clark's paper on 'Trends in Power Stations.' You might say the present trend is shutting them down." This may sound somewhat cynical; but to us engineers, who have been fighting the depression these last three years, it is only too true. With the recent improvement in the output figures, however, we are hopeful that a better day is not far distant.

Mr. Clark has given us an interesting summary of the conditions in power station development at the present time and some of the possibilities that are before us in the way of improvement of the steam cycle and also in the arrangement of plant. When our so-called "high pressure development" was started soon after the War, the possibility of savings due to improvement in the steam cycle was very considerable. The best power stations at that time were operating on a heat rate of about 19,000 Btu per kwhr. The Calumet Station started in 1921 with a heat rate somewhat under 18,000, the steam pressure being 300 lb. and the temperature about 700 deg. F. In ten years since that time the steam pressure in large size commercial plants has been increased, as you all know, to over 1200 lb. per square inch, the temperature is up to 850 deg., and many plants are operating with reheat and with various, more or less complicated, improvements in the feed water cycle, and the best heat rate in a commercial plant is between 11,500 and 12,000 Btu per kwhr for long periods of operation, so that there is now far less in prospect in the way of savings by improvements in power station efficiency. I remember reading a paper before the Advisory Committee of the Commonwealth Edison Company when we were starting on the State Line Station, in which I stated that it looked as though the best efficiency that was to be expected from a commercial electric power station for many years to come was in the neighborhood of 13,000 Btu per kwhr. At that time, however, the burning of coal in pulverized form, especially for the lower grade coals, had not reached its present degree of perfection, and the construction of water-cooled furnaces had not been improved to the point that has now been reached.

During the last few years there has been much discussion of steam cycles with initial pressures up to as high as 5000 lb. and, as Mr. Clark pointed out, there is a large plant at Langerbrugge, Belgium, operating on the Benson cycle at 3200 lb. pressure. During the same period there has also been much discussion in regard to increasing the initial temperature up to 900 or 1000 degrees, and some interesting experiments are being made by the Detroit Edison Company in that direction. In the matter of fuel efficiency, the best that any of these cycles hold out is about 10,600 Btu per kwhr if we maintain the present maximum temperatures of 825 deg., and 10,000 Btu if about 950 deg. temperature. These figures allow for auxiliary power and an average boiler efficiency of 90 per cent, and an operating ratio of 95 per cent. On this basis it looks as though the utmost possibilities of the steam cycle are between 10 and 15 per cent better than we are getting at the present time.

The combined mercury and steam cycle can show a much better efficiency, possibly something under 9300 Btu per kwhr, making the same allowance for average boiler efficiency and operating ratio as above, which is about 23 per cent better than the best plants today, so there is still quite a little left in the way of efficiency improvement.

It must be borne in mind, however, that any of these improvements involve very considerable refinement in equipment and more auxiliary power and cannot be accomplished without some considerable expenditure of money, and fixed charges are going to be the stumbling block from now on. Fuel costs and all other operating charges in steam-electric power stations have been greatly reduced in the last ten years. We can figure with a considerable degree of accuracy what the operating charges on a plant will be, but fixed charges are much more abstruse, as they involve speculation on such uncertain factors as the length of the life of the plant and what will be its average yearly output during its life, and in these days of varying money values, there is also involved some speculation as to what will be a proper interest charge. The fixed charges have been reduced somewhat by the larger size of turbines and boilers, yet the fixed charges have not come down in the same ratio as operating costs. In

these days, therefore, fixed charges are by far the most important fact in total production costs. Every addition to capital investment adds more taxes, as well as interest and depreciation and amortization charges, and there is a distinct tendency on the part of the commissions to increase depreciation charges. Therefore the balance between savings in operating costs and the consequent increase in fixed charges will have to be figured more carefully than ever before.

DISCUSSION BY E. W. ALLEN

General Electric Company

The average fuel economy in public utility plants as shown by the published figures of the National Electric Light Association, has improved about 40 per cent during the last decade, and if full advantage be taken of the developments to which Mr. Clark has referred, improvement in the next decade may be in almost the same ratio as in the past.

Total plant investment has increased at a more rapid rate than the output in kilowatt hours and the rehabilitation program mentioned under Item 12 is therefore of special interest. There are in existence today about 2,000,000 of vertical turbines and about 5,000,000 of G. E. turbines of the horizontal type for steam pressures of 250 lb. and less, and many of the latter class can be rebuilt or used in conjunction with high pressure units in the manner described by Mr. Clark. I hope, under present conditions, that you will pardon the representative of a manufacturer for pleading with you to undertake this rebuilding program without delay.

Reference is made under Item 3 to the increased capacity of single shaft turbines, and you may be interested to know that the generator of a 200,000 kv-a unit has an efficiency of 98½ per cent. With this high efficiency, it has been possible to secure a kilowatt of output with approximately 61 per cent as much material as was used in the 30,000 kw, 1800 rpm units that were available ten years ago.

The factors which have made possible these large generators are a more complete knowledge of the magnitude of the electrical losses, improvements in magnetic steel, much better systems of ventilation, and marked improvement in the quality and size of steel forgings. It is unlikely that one could find at the Century of Progress Exposition an exhibit that would represent a greater engineering achievement than the building of a 200,000 kv-a, 1800 rpm, single shaft turbine generating unit.

Vacuum tube power rectifiers are mentioned under Item 5 but the full meaning of this development to the industry is not stated. Alternating current systems of generation and distribution are inherently unstable and the operator has little control over either the amount or the direction of power flow. The application of large vacuum tube rectifiers offers a means of overcoming in part these limitations and to that extent they may become a revolutionary development in the electrical industry. The further development of these tubes and their auxiliary equipment is almost entirely dependent upon placing them in operation under service conditions. Alone, the manufacturer can do but little more in their development, and further advances must await the installation of these devices in many places.

With your help, if you are willing to install them in sufficient quantities and in numerous places, much can be accomplished. With the knowledge gained from that experience it is not unlikely that we shall have available within a decade what might otherwise represent a century of progress.

DISCUSSION BY SAMUEL M. KINTNER

Westinghouse Electric and Manufacturing Company

Mr. Clark has given us such a clearly written paper that he leaves very little place for disagreement. I find it an excellent statement of the present-day indications of the most promising directions to go in search of still greater economies. As long as there remains a theoretical possibility of still greater economies of the magnitude that now exists, just so long will serious attempt be made to secure them.

The requirement for still better materials that will be able to withstand the more severe conditions of temperatures and pressures will stimulate the research of metallurgists to find such materials.

Mr. Clark points out in two places the apparent advantages of unit arrangements: first, in the assembly of the turbine and steam generator as a single unit, and, second, in the connection of the electric generator directly to its transformers without going through switching and generator buses. The first of these, the combination of turbine and its own steam generator, makes possible a great simplification of the high-pressure piping and facilitates reheating by flue gases. This appears to offer many advantages, particularly for the small 3600 rpm high-pressure turbines.

The second combination, that of the generator directly to the transformer, is but the natural consequence of ruggedness and reliability that we have learned to build into such apparatus.

This unit arrangement, mentioned by Mr. Clark, and the decentralization suggestion made yesterday by Mr. Dow, prompts me to ask the question, does this indicate a tendency away from the ultra-large central station, or will the other considerations of material supplies, water, fuel and so forth, control?

Mr. Clark very properly calls attention to the "open air" stations as a still further hope of securing a lower cost of installation. Our studies to date on this type of station as a means of getting such lower overall cost have been rather disappointing. Possibly as more data becomes available the more troublesome points will clear away and the expected lower cost will be realized.

Mr. Clark directs attention to the improvements in efficiencies that are offered by higher steam temperatures and pressures. This is true, of course, but progress in that direction must be made with caution if reasonable reliability is also to be maintained. Steam temperatures of 850 deg. have been demonstrated to be within safe limits, but aside from smaller units, extreme caution should be exercised in going much beyond that temperature.

Our engineers are very much interested in developments of steam generators and turbines for operation at or near the critical steam pressures, and we are engaged in active studies of ways of overcoming the various difficulties that now prevent a full realization of the great theoretical advantages that such conditions offer.

It is my understanding that developments are under way by one of the engineering corporations in which diphenyl is heated to a temperature of 1000 Fahr., but at only a 50-lb. gage. The heat is

then transferred to the steam generator by the high-temperature, low-pressure fluid, and this reduces the amount of high-pressure steam piping and fittings.

I should like to second Mr. Allen's suggestion with reference to the desirability of building more stations, from the manufacturer's point of view. We stand ready to serve. The manufacturers have equipment that we believe will prove of use.

I also wish to second his suggestion with regard to the use of the thermionic tubes. They are still of the future, but they still offer a tremendous amount of promise, and the only way we are going to realize that is by actually subjecting them to field-service conditions.

DISCUSSION BY A. R. SMITH

General Electric Company

Fuel Oil

The prevailing supply and prices of oil and gas demand consideration in new designs because such fuels may make possible reduced investment which might offset an excess in the costs of these fuels over coal; or with the same investment might be the means of introducing a more efficient cycle to accomplish the same purpose. Then there is the possibility of emergency and peak load service with oil, which suggests a steam generator, of a more transportable nature, intensely fired, as contrasted with the heat accumulator, in order to coal fire the base load boilers with the cheapest fuel, at the steadiest rate and with the best operating labor load factor. Developments along such lines might lead to a very good solution of providing steam for industry.

Outdoor Stations

Many of you will recall the disputes of years ago about the relative costs of indoor and outdoor switching stations. I don't recall that it was ever officially settled, yet no one seems to be seeking an answer now. It is quite logical to build structures for human habitation and congregation that will endure for centuries because people don't change in stature, and changes in their mannerisms and requirements are gradual enough to permit remodeling. Boiler rooms used to be built to house a large number of 600-hp boilers, now the boiler has grown to such proportions as to justify its own clothing. Building structures specially constructed for apparatus of unusual design of large dimensions are seldom readily adapted to house apparatus of prevailing design a quarter of a century later. I question, therefore, the wisdom of building a structure that has a life of 100 years to house apparatus having a life of twenty-five. You don't have to predict what changes may accrue during the next quarter of a century but just fancy modernizing, without sorrowful compromises, some of the steam power plants put in service in 1908. It is just as possible that changes in the future may be more radical than during the passing era.

Schenectady Power Plant

My conception of the power plant in Schenectady was that it should be one or more power generating machines (rather than a building containing many machines), each complete enough to confine operations within and which would carry only such weather protection as was necessary; to make the building subservient to the apparatus; to leave the greatest latitude for selecting equipment for future extensions, and to invest the least money in provision for additions. The removal of building restriction should make possible greater freedom in the design of the apparatus and may completely alter our conception of such equipment. It is a means of manufacturing a greater portion of the whole in the shops instead of building it in the field. It is hoped that this development will be an incentive for others to follow some such trend which we hope will ultimately result in the minimum of investment, lowest life and fire hazard, and with no sacrifice in operating cost or dependability.

High Efficiencies

The true value of fuel economy is commonly underestimated. Apparent excess investment or increased operating troubles resulting from endeavors to improve efficiency are usually only temporary handicaps, these factors will constantly be reduced and may finally be eliminated. Assuming there may be no appreciable change in the cost of fuel during the life of the plant, there are many factors which have an influence on the investment which I want to emphasize:

A. The greater the temperature of preheated air, the more radiant heat absorbing surface can be employed. This becomes more pertinent as the temperature of the cycle is increased.
B. The more steam extraction, the smaller the turbine exhaust, the condenser, water tunnels and intake. For many reasons it is better to put more surface in heaters than condensers.
C. The more efficient the turbine, the smaller practically every other piece of apparatus in the plant.
D. The more efficient the cycle, the less fuel and condensing water, which means more capacity in same tunnels or streams and reduced pollution of the atmosphere.

Old Plants

Old stations may be classified into those which have no prospects of reconstruction and those with some apparatus of sufficient value to warrant preservation. If in the latter class, the turbine room equipment, including the condensing water supply, is reasonably modern, efficient and has many years of useful life remaining, a higher steam pressure or mercury vapor cycle may be superimposed and that additional power produced at a by-product heat rate of 4300 Btu. When such a program is considered, the plan which provides the greatest number of those kilowatts (80% thermal eff.) should be the logical solution if the investment per added kilowatt is within reason. It is significant that the mercury vapor cycle presents by far the greatest opportunity to make a large amount of such cheap power and with no changes in the feed water purity requirements.

DISCUSSION BY P. W. THOMPSON

The Detroit Edison Company

Mr. Clark's paper points out a number of probable trends in steam-electric station design. These are all of great interest to designing as well as operating engineers, and they must certainly be given serious consideration in any project involving extensions to present facilities.

Realizing the benefits of the simple regenerative cycle, The Detroit Edison Company, several years ago, undertook a series of experiments to determine the feasibility of producing and utilizing steam at temperatures considerably higher than had been attempted hereto-

fore. It was felt that materials were available or could be developed for use with temperatures around 1000 to 1100 deg. Fahr.

As a first step in this program a superperheater (oil fired for convenience) was installed in the Trenton Channel Plant for the purpose of obtaining actual experience with materials, valves, joints, etc. This was a small unit capable of taking steam at standard station pressure and temperature (400 lb.—700 deg.) and heating it to 1100 deg. Approximately 100 ft. of 4-in. piping with joints of different design conducted the steam to a de-superheater where the temperature was reduced to a usable value, to permit its use in driving one of the house service turbines. From the time this unit went into service up to May 1, this year, there have been a total of 21,179 operating hours, of which 19,348 have been at 1000 deg. or above. The greater portion of the time, operation has been at 1100 deg., there having been 15,053 hr. at this temperature. Much useful data have been and are being obtained from this test which is still in progress.

As a second step in this experiment with high steam temperatures a 10,000 kw 3600 rpm tandem compound condensing type turbine built by the British Thomson-Houston Company, and designed to operate on 1000 deg. steam was installed in the Delray Power House No. 3. In order to obtain the high temperature steam another and larger separately fired superheater was installed. This superheater was designed to raise the temperature of 88,000 lb. of steam at the normal station pressure of 400 lb. per square inch from 700 deg. to 1100 deg. Fahr. Although the use of steam at this temperature in a turbine would require a pressure of around 1000 lb. per square inch in order to obtain the maximum benefits from the higher temperature, the fact that the experiment dealt primarily with high temperatures and since no higher pressure steam was readily available, the lower pressure served the purpose adequately.

Data obtained from the experience with the Trenton Channel superheater served as a basis for the design of this superheater. There are three sections, the upper or convection section to which the steam is first admitted and containing carbon steel tubes, the intermediate section, which is a combination of radiant and convection surface and having K A 2B alloy tubes, and the final radiant section of K A 2B tubes. Thus far after over 5600 hr. of operation there have been no superheater difficulties attributable to high temperatures.

The steam piping between superheater and turbine is 8-in. K A 2S tubing containing both welded and bolted flange joints. Occasional leaks have occurred at bolted flange joints as a result of a combination of conditions such as creep of bolts, deformation of the joint faces, distortion of flanges and compression of gaskets. None of these present a serious problem however.

The turbine which has been in service the same number of hours as the superheater has been practically free from difficulties. The throttle valve has been the weak link in the chain. A new stem and bushing of nitrided steel was installed when the original stem and bushing showed evidence of growth under temperature.

The bonnet joint has been a particular nuisance due to the distortion of the bolted flanges which are obviously too light for the service imposed. A new throttle valve in which improvements have been made to correct the shortcomings of the present valve is on order and will be installed shortly.

Although no final conclusions have as yet been drawn from the results of this experiment, and will not be until considerably more time has elapsed, it can be said that decidedly fewer difficulties have been experienced than were anticipated. We believe it safe to say that a plant can be designed today for a steam temperature of 1000 deg. Fahr. and that satisfactory service could be obtained therefrom. The economies of such a choice of steam conditions has not been worked out, although both turbine and boiler builders are prepared to produce equipment for this condition.

It is hoped that further metallurgical research may result in making available cheaper high temperature resisting materials which will favor the economies of the utilization of high temperature steam.

INDUSTRIAL STANDARDIZATION AND THE A.S.A.

The following statement comes from Mr. Howard Coonley, president, American Standards Association:

"The announcement by Secretary of Commerce Roper that the simplified practice and industrial standardization work of the Bureau of Standards will be turned over to the American Standards Association has aroused many questions concerning the continuation of this work among groups which have participated in activities of the Bureau.

"I am pleased to be able to state that provision is being made for assuring continuity on the technical projects. A skeleton staff to be maintained in the discontinued divisions and sections of the Bureau during a transition period will greatly facilitate the transfer. Individual projects in standardization and simplification can be carried on without any essential change in the method. Plans are now being made for obtaining greater financial support for the A. S. A., and when this is accomplished, it is hoped that the A. S. A. may be able to take over a number of the Bureau's personnel.

"It is the belief of Secretary Roper, as well as myself, that this transfer will have far-reaching consequences for every branch of American industry concerned with standardization. The effect of the Secretary's decision is to concentrate the responsibility in a single organization representative of industry, the public, and the government. The consolidation of functions in the hands of a single organization is especially important since it comes at a time when the national economy demands a sharp acceleration in standards-making to keep pace with the need for industrial agreements under the National Recovery Act.

"We feel that this work is vital to American industry—that the possibilities for joint action opened up by the National Recovery Act will be greatly broadened if industrial and other groups can cooperate in the establishment of a comprehensive system of fundamental technical standards; and we are happy to offer to all of these groups the machinery of the American Standards Association and the Bureau of Standards—now welded into a single unit."

I.C.I. PLENARY SESSION TO BE HELD IN GERMANY, JUNE, 1935

The Plenary Sessions of the International Commission on Illumination, originally scheduled for 1934, have been postponed on account of the world-wide depression. They are to be held in Germany in June, 1935. It is planned to hold an International Illumination Congress in connection with these sessions.

NEW METHODS OF INVESTIGATING POWER SYSTEM INFLUENCE IN NOISE FREQUENCY INDUCTION PROBLEMS

In a situation involving inductive interference between power and communication circuits one of the important factors is the inductive influence at harmonic frequencies of the power system. In studying this factor it is often essential to determine separately the effects of four components, namely the residual and balanced harmonic currents, and the residual and balanced harmonic voltages. At generating stations and substations these quantities can be determined with appropriate measuring equipment by the use of suitable arrangements of current and potential transformers. When the exposure between power and telephone circuits is short and is close to such stations, measurements in the stations are generally adequate. However, when long exposures exist, or when the exposures are distant from generating stations and substations, it is often necessary to determine the influence conditions in or near the exposure. Use of instrument transformers for this purpose is usually inconvenient, and in the case of higher voltage lines often impracticable. Methods of determining power system influence by the use of exploring wires have recently been developed which avoid the necessity of using instrument transformers in such situations. These methods are described in Technical Report No. 1A-9 of the Joint Subcommittee on Development and Research.

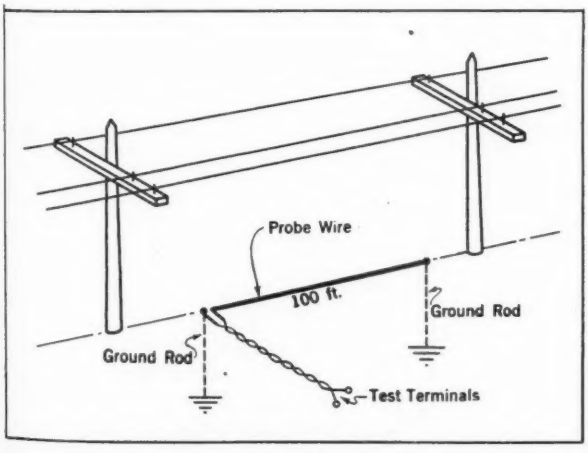
Three types of such exploring wires are illustrated in the accompanying figures. Fig. 1 shows the method of determining the influence of the power line residual current. A 100 ft. length of insulated wire, termed a "probe wire," is laid along the ground underneath the power line, and symmetrically located with respect to the power line conductors. One end of the wire is grounded, and measurements are made at the other end of the wire to a ground at that end. The symmetrical location of the wire, with respect to the power conductors, minimizes the effect of the balanced currents. Since the wire is laid on the ground the effect of both residual and balanced voltages is eliminated.

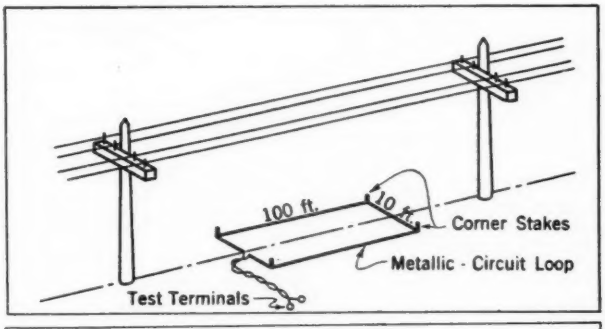
The method of investigating the influence of balanced currents by means of a "metallic-circuit loop" is illustrated in Fig. 2. An insulated wire is laid on the ground in the form of a rectangle 100 ft. long and 10 ft. wide, symmetrically located with respect to the power conductors. The effects of power line voltages are also eliminated in this case by the fact of the wire being on the ground. Since the loop is symmetrically located with respect to the power line, the effect of residual currents largely cancels out in the measurements made on the metallic circuit.

Fig. 3 shows the method of studying the influence of the power line residual voltage by means of an "antenna" consisting of 100 ft. of wire supported about 10 or 15 ft. above the ground, and symmetrically located with respect to the power conductors. The effect of the balanced voltages is largely reduced by the symmetrical location of the antenna. Since the measurement is made from one end of the antenna to ground, with the other end of the antenna isolated, the effects of the power line currents are not of practical importance.

The simplest equipment for making measurements on these exploring wires consists of apparatus for measuring noise by the ear comparison method. Reasonably satisfactory quantitative results can be obtained with this method by experienced observers. It is also possible, with some additional equipment, to obtain information on the frequency composition of the various types of power system influence. When noise is measured on the exploring wires by the ear comparison method, the power system influence is calculated by multiplying the observed value of noise by a constant and by a factor involving the physical dimensions of the power line. Detailed information on this procedure is contained in Technical Report No. 1A-9.

No exploring wire method has been developed for determining the influence of balanced voltages of the power line. Such a method would be somewhat more cumbersome than the others for field use. Furthermore, in most cases it is possible to obtain a direct measurement of this quantity, sufficient for practical needs, in the close proximity of the situation of interest.





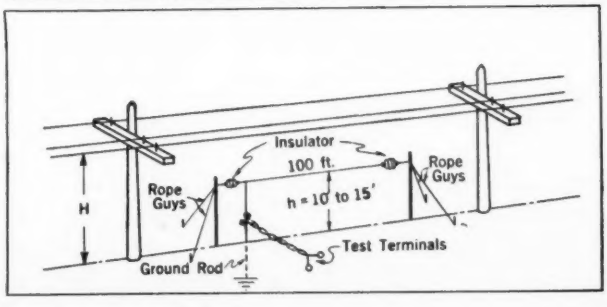


Fig. 1, Above—Probe Wire
Fig. 2, Upper Right—Metallic-Circuit Loop
Fig. 3, Lower Right—Antenna

POWER SALES ITEMS

AIR CONDITIONING

"What Does Summer Cooling Cost?" Heating and Ventilating, July, 1933, pp. 31-3. The Industrial Press, 148 Lafayette Street, New York City.

Analysis of operating data for cooling equipment in small and medium-sized buildings; ice cooling data; silica gel conditioning.

"Air Conditioning — Selecting Cooling Equipment," G. B. Halmrich. Heating and Ventilating, July, 1933, pp. 19-26. The Industrial Press, 148 Lafayette Street, New York City.

Refrigerating machines; compression units; steam ejector cooler; cooling with ice; cold water pumps; cooling coils; air filters; fans; residence cooling.

"Cooling a Basement Restaurant," Charles A. Richner. The Aerologist, July, 1933, pp. 5-8. The Aerologist Publishing Co., 121 North Clarke Street, Chicago, Ill.

Article brings out method used to overcome several minor problems that arose in connection with recent air conditioning installation in a basement restaurant in Chicago. Restaurant had always been oppressively warm due to heat from the kitchen, engine room and heat dissipated by patrons. Area of approximately 3,256 sq. ft. lowered ceiling made duct distribution impracticable, flooring foundation of steel rails in concrete made under-floor pipes and conduit impossible, city authorities frowned upon direct expansion method of cooling, owner's preference was air washing system. Problems overcome to extent that on exceedingly hot days in June system maintained dry bulb temperature from 15 deg. to 18 deg. below outside temperature, and wet bulb was reduced about 5 deg. with 175 to 200 people in room.

AIR CONDITIONING EQUIPMENT

"Present Situation in Air Conditioning Equipment." Heating and Ventilating, July, 1933, pp. 9, 12 and 16. The Industrial Press, 148 Lafayette Street, New York City.

Trends in air conditioning equipment, particularly for small and medium-sized buildings, discussion of self-contained room coolers and steam refrigeration; warm-air equipment; equipment for radiator systems; humidifying equipment; cooling equipment; cabinets with refrigerating machinery built-in; self-contained basement cabinets; reversed refrigeration.

COMPRESSORS

"Automatic Compressor for Emergency Service at Salinas, Calif.," Harry J. Smith, Engineer of Construction, Department of Gas Construction and Operation, Pacific Gas and Electric Co. Western Gas, June, 1933, pp. 8, 38. Jay Jenkins, publisher, 124 West Fourth Street, Los Angeles, Calif.

The compressor is belted to a high torque, 60 hp. motor with sliding base, 870 r.p.m., full load speed, 440 volts, 3 phase, 60 cycles.

DIESEL ENGINES

The Cotton Oil Press, May, 1933, p. 32. Interstate Publishing Co., Cotton Exchange Bldg., Memphis, Tenn.

For Sale:

1—165 hp. Vertical Worthington only operated three months, perfect condition, complete with stub shaft, outboard bearing and pulley. Centrally located. Price $4,250.00.

1—120 hp. Type Y Fairbanks hot starting, perfect condition, complete with clutch and pulley. Price $4,000.00. Centrally located.

1—80 hp. cold starting type Y Fairbanks, operated two seasons, in excellent condition, complete for cotton gin installation. Price $3,000.00. Centrally located.

Address "Engines," care of The Cotton Oil Press.

ELECTRIC FURNACES

"Electric Furnace Refractories," F. S. Russell. Institute of Metals—Journal, June, 1933, pp. lxxv-lxxx. Institute of Metals, 36 Victoria Street, London S. W. 1, England.

Increasing use of high-alumina bricks for roofs of electric furnaces; sillimanite bricks have given good service in trials; refractories produced from prefused minerals; "spalling" or "flaking"; problems which arise in connection with lining of furnaces used for brass and copper alloys; coreless high-frequency induction furnaces.

ELECTRIC HEATING

"These Two Jobs Show Application of Electric Heating to Office Buildings," L. P. Hynes. Heating, Piping & Air Conditioning, July, 1933, pp. 358-60. Engineering Publications, Inc., 190 Prairie Avenue, Chicago, Ill.

Features of heating and air conditioning plants of general office of Kingsport Utilities Co. of Kingsport, Tenn., and of local office of Atlantic City Electric Co., of Wildwood, N. J.; accurate temperature regulation saves electricity.

"Obtaining Comfort Conditions by Controlled Radiation From Electrically Heated Walls," L. W. Schad. American Institute of Electrical Engineers—Advance Paper No. 33-78, meeting June 26-30, 1933, 5 pp. American Institute of Electrical Engineers, 33 West Thirty-ninth Street, New York City.

Effect on human comfort of controlling amount of heat radiated from body; possibility of using electric energy for this application, together with equipment and operating costs. Bibliography.

ELECTRIC HOTBEDS

"Electric Hotbeds Speed Sprouting and Maturing." Electrical World, April 29, 1933, p. 554. McGraw-Hill Publishing Co., 330 West Forty-second Street, New York City.

GAS ENGINES—SEWER GAS

"Engine Using Sludge Gas Drives Sewage-Plant Blower," W. B. Walraven, District Engineer, Springfield Sanitary District, Springfield, Ill. Engineering News-Record, May 25, 1933, pp. 682-3. McGraw-Hill Publishing Co., 330 West Forty-second St., New York City.

Heat contained in engine cooling water and exhaust gases is utilized to heat sludge in digestion tanks. According to the tests run this engine, which is rated at 177 i.h.p. at 514 r.p.m. delivers 87.7 bhp. at 307 r.p.m., which will be its normal operating speed. At this speed 1250 b.t.u.'s are required per bhp. hour.

HEAT RECOVERY—REFRIGERATORS

"Heating a Building by Means of Refrigerator," T. B. Morley. Engineer, June 30, 1933, p. 655. Engineering Societies of the Alabama Polytechnic Institute, Auburn, Ala.

Acting on suggestion of P. Worthington, architect, Cramp and Frith employed refrigerator to serve dual purpose of providing heat and cold; ordinary refrigerator, using methyl chloride, is installed for maintaining cold chamber at 30 to 33 F. and heat discharged from condenser is used to maintain temperature of 80 F. in linen store; heat delivered is actually multiple of that supplied electrically.

PAPER AND PULP MILLS

"Windowless Paper Mill," A. E. Montgomery. Paper Trade Journal, June 15, 1933, pp. 38-9. Lockwood Trade Journal Co., 15 West Forty-seventh Street, New York City.

All lighting accomplished with General Electric Cooper-Hewitt units having Uviol tubes; Briner economizers recover heat in exhaust vapor for heating incoming air; ventilation ducts deliver supply equivalent in volume to that which must be exhausted from paper machine; windowless construction enables machine room to be heated and ventilated with unusually low supply air temperature. Before American Pulp and Paper Mill Superintendents.

POWER APPLICATIONS

"Connected Loads and Demands of Anthracite Breaker Power Applications." Electrical World, May 6, 1933, p. 583. McGraw-Hill Publishing Co., 330 West Forty-second Street, New York City.

POWER FACTOR

"This Thing Called Power Factor—VIII." Power Plant Engineering, July, 1933, pp. 298-300. Technical Publishing Co., Monadnock Block, 53 West Jackson Boulevard, Chicago, Ill.

Difference between synchronous and induction motors with respect to pf.; effect of mechanical load on synchronous motor action.

"Power-factor Correction," P. R. Coursey. Electrical Review, June 16, 1933, p. 867. Electrical Review Ltd., 4 Ludgate Hill, London E.C. 4, England.

Economic value of condensers; examples of power factor correction condensers including direct-connected 550-v., 3-phase, 135-kva. non-adjustable condenser, equipment for manual on-load adjustment and bank with automatic control cubicle.

POWER SALES

"How to Sell Power," J. F. Gaskill, Manager Industrial Sales, Philadelphia Electric Co. Electrical World, April 8, 1933, pp. 459-61. McGraw-Hill Publishing Co., 330 West Forty-second Street, New York City.

Local market analysis. Cooperation with other sales agencies. The use of trained but unspecialized salesmen. Examples of success.

INDUSTRIAL HEATING NEWS

Contributed by Industrial Power & Heating Committee, E.E.I.

ELECTRIC STEAM GENERATOR DETECTS PRESENCE OF COPPER IN METALLIC MAGNESIUM

The production of metallic magnesium free of copper is a difficult thing to accomplish, and the manufacturers who are doing this successfully make careful laboratory tests of the finished product to make sure that their customers receive a uniformly, high-grade metallic magnesium, free of copper.

It has been found that chemical tests do not determine the presence of copper to the nicety required. The most effective method thus far discovered, is to subject the magnesium to a bath of live steam under high pressure. The latter method produces a marked discoloration, easy of detection, when copper is present.

A Cleveland company that manufactures large quantities of metallic magnesium ribbon for incandescent lamps has provided a simple and inexpensive means of producing the steam required. They have built an experimental digester for their laboratory which produces steam at pressures up to 500 lb. It consists of a cast cylinder in which 2-5 kw. heating units are cast in the side walls. Adequate heat insulation has been applied and there is a pressure-tight cover. The samples to be treated are placed directly within the generator (on aluminum shelves at the top) which is, in effect, an autoclave.

"DIP" PROVIDES NEW DRESS FOR A LEMON

At first glance the reader of this headline might jump to the conclusion that "Dip" is a philanderer. Quite the contrary, he is a straight-forward little fellow that goes about his job of liquid heating in a business-like and honest way. He's a two-timer only in the sense that you can absolutely depend upon him to do the same good job consistently, over and over again.

Knowing this, the Citrus Packing Industry chose him to melt the wax that is so extensively used to enhance and preserve the appearance of that article which is so absent in circus lemonade, namely the lemon.

Perhaps you have noticed that the lemons you have bought in recent years from your neighborhood fruit vendor are plumper and brighter than the lemons you used to buy for that 1c. lemonade stand that you and the kid next door had as your first business venture. Yes, sir, they are brighter and "Dip" is too, because he's always tickled to be of service—even to a lemon.

Before lemons are packed, they are washed thoroughly. This washing removes some of the natural wax from the surface and leaves the poor old lemon a prey to the elements, unless the wax is restored. That's where "Dip" comes in. The wax emulsion is held in a tank underneath the spraying machine. In this tank, two 5 kw. "Dips" and a thermostat keep the wax at the correct coating temperature. Regardless of the tonnage of lemons passing underneath the spray, the temperature of the wax is held at the correct temperature for best results.

ROPE BUYERS PREFER PLATINUM BLONDES

If the popularity of Jean Harlow is any criterion, the platinum blonde has the call over her sister, the peroxide blonde. Some manufacturers of hemp rope have been quick to recognize this color consciousness and now are in position to offer their product in a shade that exactly emulates Jean Harlow's crowning glory.

The ordinary weatherproofing oils used in rope production, if unevenly heated, have a tendency to impart to the hemp a yellowish tinge, which is becoming an unpopular color. When these oils are evenly heated with electric immersion units and thermostatically controlled, the hemp is given the more desirable "platinum blonde" finish.

A California manufacturer of hemp rope who has adopted this new finish employs the following equipment—an oil container about 18 in. square by 5 ft. long is half-filled with weatherproofing oil (approximately 25 gal.) The oil is heated by 4 3-kw. oil immersion heaters, each thermostatically controlled. The oil is fed to the fibre, which passes through the machine continuously, by means of small jets adjusted to give the proper flow.

MIDGET HEATERS HELP REDUCE COST OF RURAL ELECTRIFICATION LINES

The problem of what to do with poles that have rotted off at their base has been solved by The Detroit Edison Company. This Company decided some time ago to reclaim such poles by cutting the decayed portion off and, after giving them a butt treatment, sending them to rural districts for the construction of farm lines.

The solution to the problem was not apparent until some method had been developed for the butt treatment, which was considered necessary to obtain satisfactory pole life. After some thought had been given to this problem, it was decided to impregnate the poles with water gas tar, which is a by-product of The Detroit Edison Company's Marysville Gas Plant. An experimental installation was made, using an old 1000 kv-a. transformer case as the impregnating tank. On account of the viscosity of the tar and also because it was desirable to obtain satisfactory impregnation in the least possible time, it was necessary to install immersion heaters in the tank. Four 5 kw. oil immersion units were used.

This first installation was very successful, although it was found that a larger treating tank would be more practical. The second and latest installation made use of an old 6000 kv-a. transformer tank. This tank is 7 ft. in diameter by 10 ft. in height, and can accommodate approximately 16 medium-size poles. Five oil immersion units were found to be sufficient to provide the necessary amount of heat to the tar. The installation of the heating units was made so that they would be protected from mechanical damage. This was accomplished by installing the units in compartments formed by welding rectangular shaped pieces of steel to the outside of the tank. The compartments were spaced equally around the outside and made a part of the tank by burning holes through the casing. These holes were located in such a way as to provide circulation paths from the bottom of the tank up through the heating unit compartments to the top of the tank. This design has proven very effective in providing uniform heat distribution throughout the tank.

At the present time, general operating data are not available. However, it can be stated that under the most severe conditions, the energy consumption per pole is not expected to exceed 9 kwhr. The degree of impregnation obtained by these treating tanks is considered very satisfactory.

The success of these heating tanks has contributed in no small way to reducing the costs of farm lines. Two more installations such as described above will be made in the near future.

"IN THE SMOKE HOUSE THERE'S A HAM"

From Boise, Idaho, comes this interesting story about a strip heater. He's out there doing a whale of a job curing hams faster and better. Here's how he does it:

A metal box, approximately 7 ft. long, 4 ft. wide and 6 ft. high is lined with 2 thicknesses of wood and a layer of balsam wool, with another metal lining on the inside. A 1/6 hp. motor direct connected to a fan is mounted on top of the box which furnishes air to a small sawdust burner and then forces the smoke down through narrow passageways on both sides of the box into the bottom of the smoke room, where it circulates around the meat and emits through a 4 in. pipe in the top of the smoke room.

As the smoke is blown from the blower through the passageway, the forced air which carries the smoke from the burner is heated by five 500-watt strip heaters which are mounted in the passageway.

The temperature of this air is controlled by a thermostat having a range of 100 deg. to 200 deg. Fahr. The thermostat operates a magnetic switch which carries the heating load.

This size box will accommodate approximately 800 lb. of ham and will smoke them in 4 hr., as against 10 or 12 hr. by the old method. A saving of more than 10 per cent in weight is also obtained.

A STUDY OF FUEL AND ELECTRIC FURNACES

Electric Light and Power from January, 1933, to May, 1933, inclusive, carried a series of articles by Wirt Scott of the Westinghouse Electric & Manufacturing Company. These articles carried definite and helpful data, much of which was plotted on curves. Every power salesman should read these articles as they present a number of definite proofs of the superiority of electric heat.

PRIZE WINNERS IN RANGE CONTEST

(*Continued from page* 134)

Honorable mention was awarded to the progressive activities of the following Councils—Empire-New York group of the Associated Gas and Electric System, sponsored by Mr. William F. Moses, merchandise manager; Spokane Electric Cookery Council, Mr. R. B. McElroy, sponsor; Springfield, Mass., Electric Cookery Council, Mr. H. W. Lawrence, chairman; Twin Falls, Idaho, Cookery Council, Mr. Claude Detweiler, chairman; Brockton Electric Cookery Council, Mr. W. E. McCreery, chairman.

Commercial Managers' Contest—In appraising the reports in this contest the judges considered: (a) the extent to which the local utility had cooperated within the local council in making the local promotions a success, (b) the proportion of dealers induced to participate in relation to the potential list of local dealers, (c) the extent of the local council's success in meeting its assigned quota of range sales.

The three prizes totaling $600 were awarded as follows—first prize to Mr. Robert H. Giedd, commercial manager of the Virginia Public Service Co., Alexandria, Va.; second prize to Mr. A. Wilson Barstow, commercial manager of the Narragansett Electric Co., Providence, R. I.; third prize to Mr. L. W. Brainard, commercial manager of the Idaho Power Co., Boise, Idaho.

Honorable mention was voted by the judges to Mr. T. C. Harvey, commercial manager of the Public Service Company of New Hampshire; Mr. E. C. Hathaway, commercial manager of the Twin State Gas & Electric Co.; Mr. A. A. Brown, commercial manager of Oklahoma Gas & Electric Co.; Mr. J. H. Van Aernam, sales promotion manager of New York Power & Light Corp.

Range Dealers' Contest—From among the 11 electric range dealers winning Neon Store Signs, who had been selected by the divisional directors in their respective divisions, the National Judges awarded the national prize of $250 to The Wallace Co., department store of Pittsfield, Mass.

The Divisional winners of Neon Store Signs are—

New England Division, The Wallace Co., Pittsfield, Mass.

Great Lakes Division, Leiby Plumbing & Electric Co., Milwaukee, Wis.

Southwestern Division, Spurrier's, Inc., Oklahoma City, Okla.

North Central Division, A. S. Dunning, Inc., Duluth, Minn.

Pacific Coast Division, Guilbert Bros. Electric Co., San Jose, Cal.

Southeastern Division, R. S. Montgomery, Inc., Richmond, Va.

Eastern Division, Rohrer Electric Co., Inc., Niagara Falls, N. Y.

Northwest Division, Oakley & Sons, Boise, Idaho.

Rocky Mountain Division, Rhueff Electric Co., Pueblo, Colo.

Retail Salesmen's Contest—The 18 prize-winning retail salesmen among whom $1,500 was awarded are as follows:

First prize, D. Ray Finegan, Spurrier's, Inc., Oklahoma City, Okla. (Sold 87 ranges)

Second prize, D. R. DeChaine, Midland Counties Public Service Co., Paso Robles, Cal. (Sold 68 ranges)

Third prize, Lawrence A. Krieg, Pacific Gas & Electric Co., Stockton, Cal. (Sold 50 ranges)

Fourth prize, E. A. Walter, Virginia Electric & Power Co., Richmond, Va. (Sold 44 ranges)

Fifth prize, A. J. Axness, Minneapolis General Electric Co., Minneapolis, Minn. (Sold 40 ranges)

Sixth prize, K. H. Craigie, The Edison Electric Illuminating Co. of Boston, Boston, Mass. (Sold 39 ranges)

Seventh prize, J. E. Owens, Oklahoma City, Okla. (Sold 38 ranges)

Eighth prize, C. M. Lamb, United Electric Light Co., Springfield, Mass. (Sold 35 ranges)

Ninth prize, Raymond H. Rossignol, Narragansett Electric Co., Providence, R. I. (Sold 33 ranges)

Tenth prize, Victor C. Moose, Minneapolis General Electric Co., Minneapolis, Minn. (Sold 32 ranges)

Eleventh prize, H. W. McCracken, Virginia Public Service Co., Hinton, W. Va. (Sold 32 ranges)

Twelfth prize, W. J. Kelley, New York State Electric & Gas Corp., Oneonta, N. Y. (Sold 31 ranges)

Thirteenth prize, Wm. B. Fanyo, Central Illinois Public Service Co., Watseka, Ill. (Sold 31 ranges)

Fourteenth prize, J. B. Mooney, Oklahoma City, Okla. (Sold 29 ranges)

Fifteenth prize, Harry B. Johns, Niagara Falls, N. Y. (Sold 29 ranges)

Sixteenth prize, Frank Fischer, Niagara Falls, N. Y. (Sold 29 ranges)

Seventeenth prize, R. G. Forsyth, Minneapolis General Electric Co., Minneapolis, Minn. (Sold 29 ranges)

Eighteenth prize, George J. Shepherd, Virginia Electric & Power Co., Chester, Va. (Sold 26 ranges)

REVIEWS

THE ELECTRIC LIGHT AND POWER INDUSTRY—1932

Statistical Bulletin No. 9, Pub. No. A-1, 21 pages. Published by Edison Electric Institute. Price to members and their employees 30c.; to non-members in the U. S. A. 75c; to foreign countries 85c.

This bulletin constitutes the seventh consecutive annual statistical report of the operations of the electric light and power industry since the establishment of comprehensive statistics in 1926. It contains the complete exhibit of the operating results for the year 1932, determined from some 400 companies and municipal plants and augmented and extended to cover 100 per cent of the electric light and power business.

In addition to the usual historical data, this year's report has been considerably enlarged by the inclusion of the summaries of the monthly and weekly statistics. A page which is of growing value to students of the public utility industry is the recapitulation, month by month since January, 1928, of kilowatt hours sold to domestic, commercial and industrial customers and of total revenues received from ultimate consumers. Another new exhibit is the table of weekly power output figures, arranged across two facing pages so that the total electric production for each week can be compared with the same week in each previous year back to 1928. With the acceptance of electric power production as the leading index of the country's business activity, this table will be of considerable interest.

In its annual analysis of the interstate transfer of electric power, the report points out that the chief reason why the volume of interstate power has not shrunk in proportion to the decline in generation of electricity has been the greatly improved water conditions of the past year. The production of electricity by water power plants increased by 12.4 per cent over the figures of the year before and even exceeded those of the year 1928, the previous high record, and the ratio of hydro-electric energy in the grand total of all electricity rose in 1932 to 40.4 per cent; the highest figure in the history of the industry. A large number of water power plants are situated on rivers which constitute State boundaries or else they are separated by State lines from the power markets for which they were designed and the largest increases in interstate power relative to 1931 were in connection with the States in which these plants are located. Apart from minor variations which may be accounted for by the effect of the depression upon particular power markets, the volume of interstate power showed a decline in those States served largely by steam plants.

TURBINES

Report of former Prime Movers Committee, published by Edison Electric Institute. Pub. No. A-3. Price, 75c. to members and their employees; $1.85 to non-members; $2.00 to foreign countries.

This report includes:

1932 operating records of 291 large turbines.

1932 operating records of 12 turbines operating above 1000 lb. gage steam pressure.

New data upon outages for inspection and overhaul.

Operating data and new information on blade erosion.

Statements on lubricating oil fires.

New Methods of inspecting blading for hair cracks.

Experience with turning gears.

A new device for program loading of a station.

Data on removal of moisture at bleeder points.

The washing of soluble solids from turbine blades.

The correction to unit performance for undercooled condensate.

Test data on (a) the largest, 1200 lb. turbine in the world, (b) the largest turbine of any pressure in the world, (c) a turbine using 825 F steam temperature, (d) 6 additional turbines.

Manufacturers' statements covering latest developments.

CABLE OPERATION—1932

Report of former Underground Systems Committee, published by Edison Electric Institute. Pub. No. A-10. Price, 45c. to members and their employees; $1.15 to non-members; $1.25 to foreign countries.

During 1932 the total rate of cable, joint, and pothead failures on high voltage underground systems was about 21 per cent less than that during the previous year. The decrease appeared in the rate for each of these three constituents. The lower rate for cables was produced mainly by a 27 per cent decrease in the failures due to causes over which the operating companies have control.

As in previous years, about 36 per cent of all cable failures and anticipated failures occurred in manholes which contain about 3 per cent of the cable.

Based on operating records, little or no improvement has been made in the average quality of high voltage cables as manufactured in the last four years.

The average rate of failure for low voltage cables was about the same as that for high voltage cables. The average rate of failure for low voltage joints was only 20 per cent of that for high voltage joints, and the rate for low voltage potheads was about 63 per cent of that for high voltage potheads. The lowest rate of cable failures was on a-c secondary networks which are generally recent installations; the highest rate was on street lighting cables.

The rate of sheath repairs on high voltage cable in manholes, 3.1 repairs per 100 miles of cable, was about the same in 1932 as in 1931. Over half of the troubles were due to bending and wearing on supports and at duct mouths produced by cable movement.

STATION PIPING

Report of former Prime Movers Committee, published by Edison Electric Institute. Pub. No. A-2. Price, 60c. to members and their employees; $1.50 to non-members; $1.60 to foreign countries.

This report includes:

General Statements.

Recommendations for Prevention of Turbine Oil Fires.

Changes in Steel Flange Standards.

Study of 4-bolt, 600 lb. Flanged Joint.

Bolting Material for H-T Service.

H-T Piping-Delray.

Forged Piping and Joints for 1450 lb., 830 F.

Three H-P Welded Piping Installations.

Difficulties with Seamless Piping, Flanges, and Steel Castings.

Operating Company Statements.

Field Welding of Piping.

Piping and Joints for H-T and H.P Service.

Tubing for Instrument Connections.

Valves for H-T and H-P Service.

Large Reducing Valves and Desuperheaters.

Manufacturers' Statements.

LOAD AND REVENUE FORECASTING

Report of former Power Systems Engineering Committee, published by Edison Electric Institute. Pub. No. A-16. Price, 30c. to members and their employees; 75c. to non-members; 85c. to foreign countries.

This report is presented as a guide for those charged with the direct responsibility for load and revenue forecasting.

The report consists of five general sections and a bibliography. The first section deals with principles and general theory and the remaining sections show the applications of these principles and a broad outline of the possible market for electrical energy.

CURRENT CARRYING CAPACITY OF IMPREGNATED PAPER INSULATED CABLE

Report of former Underground Systems Committee, published by Edison Electric Institute. Pub. No. A-14. Price, 25c. to members and their employees; 65c. to non-members; 85c. to foreign countries.

This report lists the current carrying capacities of impregnated paper insulated cable for load factors of 50, 75 and 100 per cent in underground duct banks containing 3, 6, 9, or 12 cables in the outside ducts and for any load factor from 50 to 100 per cent in air.

The types of cable considered are three conductor sector shielded type "H" cable, three conductor round or sector belted cable, single conductor standard strand cable, and single conductor annular cables. Ratings for d-c cables can be obtained by means of correction factors listed on the report.

The constants and assumptions used in calculating the cable rating tables are based upon standard conditions adopted by the former National Electric Light Association and are representative of conservatively average field conditions in this country.

The formulae and methods used in arriving at the current carrying capacities are included in the report along with a discussion of how the dielectric loss and additional a-c losses were considered.

LOAD AREA DEVELOPMENT

Report of former Power Systems Engineering Committee, published by Edison Electric Institute. Pub. No. A-11. Price, 30c. to members and their employees; 75c. to non-members; 85c. to foreign countries.

The problems of central station power system engineering may be divided into two main classes; the generation and (in many cases) bulk power transmission to large substations at natural load centers, and the distribution of energy in any load area from these supply substations (or power stations) to the consumers. This report deals with the problems of the latter classification, namely, from the transmission substation (or centrally located power plant) to the customer.

The principal subdivisions of the report are:

I. Outline of Engineering Problem.
II. System Capacity and Service Continuity.
III. Selection of Circuit Voltages.

Circuit voltage data and equipment outage figures are presented as obtained from questionnaires to representative systems.

In the Appendices there are descriptions of three systems serving different types of load. These descriptions are presented to show practical examples of how the problems of load area development have been solved in those particular cases.

MERCHANDISING ELECTRICAL APPLIANCES

A Report of the Electrical Merchandising Joint Committee, Kenneth Dameron, Editor, The Electrical Merchandising Joint Committee, 1933, 330 pp. 62 tables, illustrations, and forms, $4. A special discount of 35 per cent will be given to members of the Edison Electric Institute. Orders should be sent to Electrical Merchandising Committee, 225 West 34th Street, New York, N. Y.

Merchandising electrical appliances is a practical manual designed for the use of retailers, manufacturers, wholesalers, utilities, and advertising and sales executives. It is developed from the angle of the merchandiser. Based on a three-year study, it contains timely facts and summarizes the actual experience of those engaged in electrical appliance merchandising. The book is divided into ten chapters, with convenient subdivisions and summaries.

Chapter I, Market Opportunities in an Electric Age, presents basic facts of consumer demand for electrical household appliances. The factors in the consumer market are definitely measured and the merchandiser is shown ways and means of cultivating this market. This section also discusses consumer relations with utilities, electrical dealers and contract dealers.

Chapter II, Channels of Distribution, reviews these channels and describes the movement of appliances from manufacturer through wholesaler, retailer, or utility to consumer. This gives the retailer an intimate appraisal of the policies of his merchandise resources. Chapters III and IV review the merchandising problems of utilities, hardware and furniture stores in their distribution of appliances. Chapter III was prepared by Mr. C. E. Greenwood of the Edison Electric Institute and the materials for Chapter IV were submitted by R. J. Atkinson of the National Retail Hardware Association and Harry F. Cappel of the National Retail Furniture Association.

Chapter V, Department Store Merchandising of Electrical Appliances, is a distinct contribution to the literature of merchandising. For the first time, merchandising data are presented by item. Problems of a separate appliance department in non-electrical stores, leased sections, and electrical appliances as a part of house furnishings are discussed. What are the fastest selling prices? What markup should be obtained on electric washers? What turnover should be obtained? What is the percentage of electrical appliance sales to total store sales? These and other questions are answered in Chapter V.

Chapter VI, Advertising and Sales Promotion, is a "how" chapter based on facts. Through the investigations of the Electrical Merchandising Joint Committee, effective advertising methods and their results have been analyzed. How should the appropriation be budgeted by media? What appeals and headlines are most effective? How does monthly advertising effort correspond to monthly sales results? On what days should the various appliances be advertised? These questions and others are answered in Chapter VI. To complete the review of sales promotion, the home service department of utilities is described in Chapter VII.

Price and service policies are discussed in Chapter VIII. Installment sales data by appliance and by store type are features of this chapter. Should utilities assist retailers in consumer financing is an important problem discussed in this chapter. Problems of service, repair, guarantee, and installation are reviewed in Chapter VIII.

Chapter IX, Testing Electrical Appliances, is in many respects a review of the necessity for selling quality products. From a practical standpoint, facilities for testing, examples of testing, and a program for testing are offered. This problem is one of the very important aspects of merchandising of electrical appliances. Chapter X, Trade Relations, reviews the merchandising relationships between retail stores and utilities. It offers a practical solution for trade difficulties.

"Merchandising Electrical Appliances" should be of unusual interest to all merchandising and sales executives. The fact that it is based upon a definite analysis of market facts gives it first rank among recent merchandising studies.

"Merchandising Electrical Appliances" will be on sale in August at $4 per copy. A discount of 35 per cent will apply to all members of the Edison Electric Institute, and former (1932) utility and manufacturer members of National Electric Light Association.

REFRIGERATION WEEK

(*Continued from page* 135)

held in the past, and will include complete data on exhibits in a number of cities, classified according to population, which may serve as models for those communities where shows will be held for the first time.

"In the same mailing will be included a broadside folder which will contain reproductions of a new series of cooperative newspaper advertisements, mats of which may be obtained free of charge at the Bureau's home office. A list of cost prices at which posters, window streamers, cut-outs and other advertising material may be obtained will also be included.

"On Sept. 10 the final folder will be issued. This will set forth the details of the national Electric Refrigeration Week Contest and will contain an entry blank to be filled in and returned by the competing Bureau or other local organization. The rules of this contest are so drawn that the smallest community has an equal chance with the largest to win any one of the seven cash prizes which range from $500 down to $25. These prizes are offered for the best shows put on during Electric Refrigeration Week and will be awarded on the basis of results in actual sales and prospects obtained, in proportion to population and the number of domestic meters, with due regard given to the degree in which local sales outlets cooperate and the amount spent on the exhibit and promotional work connected with it.

"Last year more than 300 communities staged refrigeration shows during Electric Refrigeration Week. This spring, due to the encouragement afforded by the success of the fall shows, nearly 400 independent exhibits of a similar character were held throughout the country. It cannot be denied that these 700 shows played a prominent part in the unprecedented sales activity which had its inception at the end of the bank holiday with the inauguration of the 'New Deal.'

"I note with interest and extreme satisfaction that at the end of June 38 States had exceeded their quotas in the Bureau's national promotional campaign for 1933. This indicates that at the present time the public acceptance of electric refrigeration is more widely distributed than ever before. With public interest thus spread over the entire country, it goes without saying that there is now presented an opportunity for holding a greater number of successful shows, in more widely distributed areas, than at any time since the start of the national Bureau activity. There seems to be no valid reason why there should not be an electric refrigeration exhibit in every city and important village in the United States from Sept. 30 to Oct. 7.

"Start NOW to make your plans for participation in Electric Refrigeration Week."

JUNE SETS NEW SALES RECORD

With 213,420 household electric refrigerators sold in the United States in June, the all-time record for a single month's sales was broken for the second successive month. The June figure brings the total for the first six months of the year to 666,750 units, compared to 589,955 sold in the same period last year. In the record year, 1931, when the year's unit sales approximated 965,000, the total sales for the first six months were 597,454 units.

The six-months total represents 129.8 per cent of the quota of 513,389 set for the period by the Bureau in its promotional campaign to sell 800,000 units in 1933. At the end of June, 38 States had exceeded their period quotas. This is by far the greatest number of States ever to be ahead of their quotas at any one time since the start of the Bureau activity. Virginia led the country with a quota realization percentage of 195.8. West Virginia was a close second with 193.1 per cent, and North Carolina, Georgia, Maryland, Missouri, Alabama and Texas were closely bunched near the top of the list.

New York continued to lead in volume of sales, its six-months total of 108,494 being nearly one-sixth of the total for the entire country. But perhaps the most significant fact which the figures reveal is that in the first six months 14 States had sold more than their entire year's quotas.

WHOLESALE POWER PRICES ARE NOW DECREASING, NOT RISING

Several newspapers have reprinted the report of the Bureau of Labor Statistics on its survey of price trends since 1929 with the comment that "the wholesale prices of twenty-seven commodities, including electricity, gas and anthracite, are shown to have increased during the depression." They call attention to the Bureau's table showing a nine per cent increase in the price of wholesale power in February, 1933, over June of 1929. The facts in relation to the price of industrial electricity are shown by the following figures:

AVERAGE PRICE OF LARGE (WHOLESALE) ELECTRIC LIGHT AND POWER

	Per Kwhr.	Increase over June, 1929
June, 1929	1.381 cents	....
June, 1930	1.421 cents	2.9%
June, 1931	1.466 cents	6.2%
June, 1932	1.545 cents	11.9%
February, 1933	1.506 cents	9.0%
March, 1933	1.470 cents	6.4%
April, 1933	1.438 cents	4.1%
May, 1933	1.383 cents	....
		Decrease
June, 1933	1.337 cents	—3.2%

The average for June, 1933, is .044 cents, or 3.2 per cent below June of 1929 and .208 cents, or 13.5 per cent below the average of a year ago.

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CODE ACCEPTED

(*Continued from page* 133)

between 7 a. m. and 7 p. m., in such work as will not interfere with hours of day school.

III

Hours of Employment and Wages

The following paragraphs in this section III are in substitution for paragraphs 2 to 7, inclusive, of the President's Reemployment Agreement:

(A) No employee shall work for more than an average of 40 hours per week during any six weeks' period, except those specified in Paragraph (B).

(B) Load dispatchers, emergency maintenance and repair employees, station and substation operators, their attendants, crews and helpers, if highly trained and not readily replaceable, whose duties must be continuously performed in order to render the public a safe and continuous service, may be employed not in excess of 48 hours per week, so long as other competent employees are not readily available for such work, and in emergencies such employees may work more than 48 hours per week, but in no case shall the hours worked exceed an average of 48 hours for 6 consecutive weeks. All employers subject to this Code shall proceed with the training of additional employees as rapidly as is consistent with the rendition of safe and continuous service, so that by March 1, 1934, as many employees as possible may be reclassified under the 40 hours per week limitation; and report shall be made on said date of the extent of such reclassification to the National Recovery Administration.

(C) The maximum hours fixed in the foregoing paragraphs shall not apply where not more than 2 persons are employed in communities of less than 2,500 population, which communities are not part of a larger trade area; nor to employees engaged on emergency work; nor to outside salesmen; nor to employees in a managerial, executive, administrative or supervisory capacity, who now receive more than $35 a week. Population for the purposes of this agreement shall be determined by reference to the 1930 Federal Census.

(D) Employees shall be paid at the rate of:

(1) Not less than $15 a week in any city of over 500,000 population or in the immediate trade area of such city;

(2) Not less than $14.50 a week in any city between 250,000 and 500,000 population or in the immediate trade area of such city;

(3) Not less than $14 a week in any city between 2,500 and 250,000 population or in the immediate trade area of such city, and

(4) In towns of less than 2,500 population all wages shall be increased by not less than 20 per cent, provided that this shall not require wages in excess of $12 a week.

(5) This paragraph shall apply to all employees, except those covered by the provisions of the following paragraph "E."

(E) Employees of the classes who, on July 1, 1933, were paid on an hourly rate shall be paid not less than 40c. per hour, unless the hourly rate for the same class of work on July 15, 1929, was less than 40c. per hour, in which latter case the rate of pay shall not be less than the July 15, 1929 hourly rate of pay and, in any event, shall not be less than 30c. per hour; provided that learners may be paid not less than 80 per cent of the minimum wage rate provided in the above schedule, but the total number of learners shall not exceed 5 per cent of the total number of employees employed by any employer subject to this Code.

IV

Application

If any employer in the light and power industry is also an employer in any other industry, the provisions of this agreement shall apply to and affect only that portion of his business which is included in this industry.

V

Administration

The Edison Electric Institute is hereby designated the agency for administering, supervising and promoting the performance of the provisions of this Code by the members of the light and power industry. The Edison Electric Institute shall appoint a Recovery Executive Committee to exercise such functions on behalf of the Edison Electric Institute, and the facilities and departments of the Edison Electric Institute shall be available to make the administration effective and efficient.

In order to keep the President of the United States and the Administrator informed as to the observance or non-observance of this Code, each employer shall prepare and file with the statistical department of the Edison Electric Institute at such times and in such manner as may be prescribed, statistics covering the number of persons employed, wage rates, earnings, hours of work and such other data or information as the Recovery Executive Committee may from time to time require.

Any employer in the light and power industry may participate in this Code and in any revisions or additions thereto by signifying his intention and agreeing to pay to the Edison Electric Institute the proper pro rata share of the cost of creating and administering this Code.

VI

Amendments

Such of the provisions of this Code as are not required to be included therein by the National Industrial Recovery Act, may with the approval of the President, be modified or eliminated as changes and circumstances or experience may indicate.

This Code shall become effective when approved. Dated, Aug. 4, 1933; as amended Aug. 11, 1933.

EDISON ELECTRIC INSTITUTE,
By GEORGE B. CORTELYOU,
President,
420 Lexington Avenue,
New York City, N. Y.

After consideration, and with the approval of labor advisors and industrial advisors, as shown hereon, I recommend that N.R.A. elect to substitute said Code provisions for said provisions of the P.R.A. and to authorize employers to sign the agreement subject to such substitution and to signify their compliance with the P.R.A. by adding to the standard statement of compliance the following sentence:

"To the extent of N.R.A. consent as announced we have complied with the President's Agreement by complying with the substituted provisions of the Code submitted for the Electric Light and Power Industry."

Approved:

W. C. TEAGLE,
Industrial Advisor.

W. J. WOOLSTON,
Labor Advisor.

DONALD R. RICHBERG,
Legal Department.

DUDLEY CATES,
Assistant Administrator.

HUGH S. JOHNSON,
Administrator.

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